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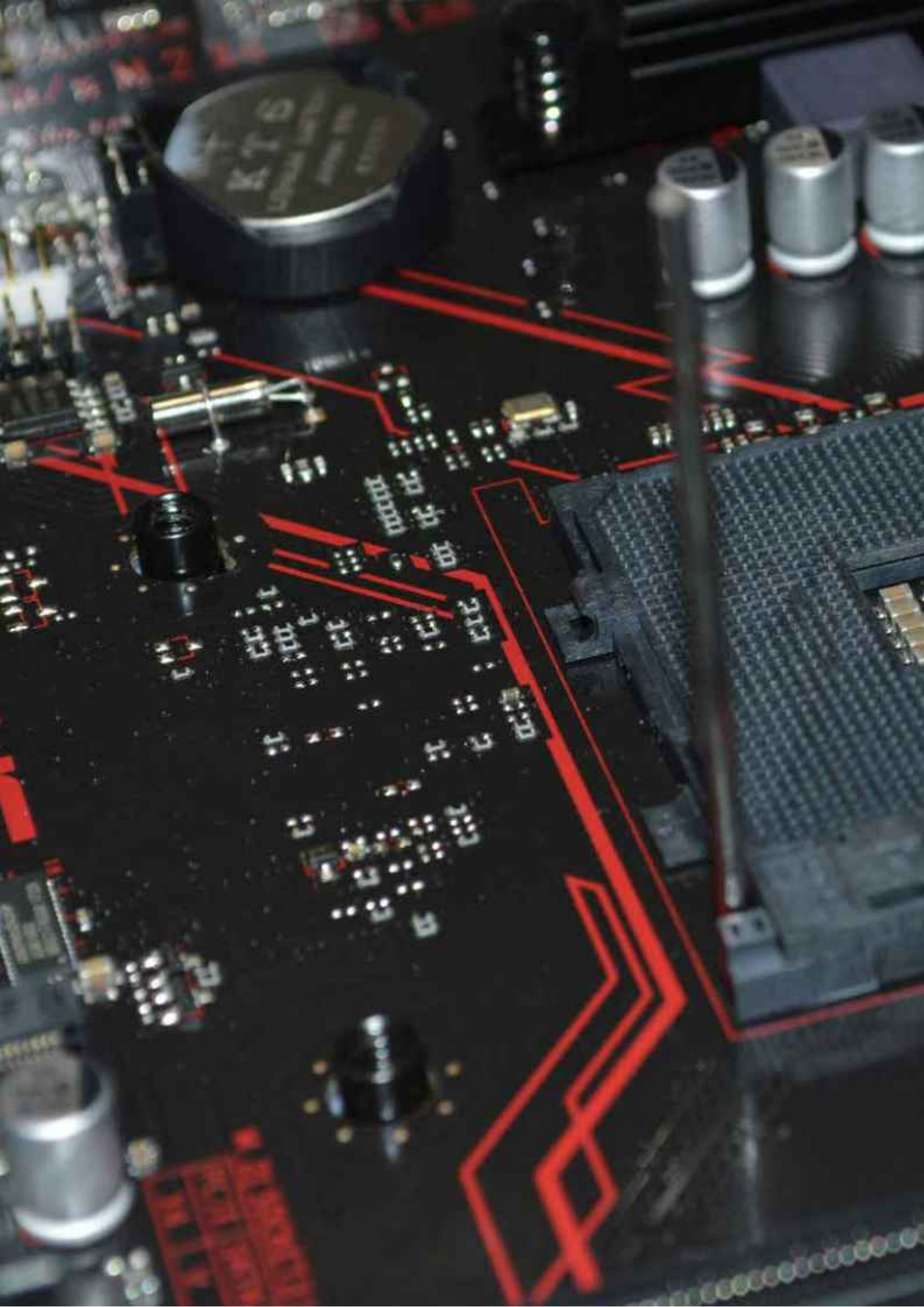
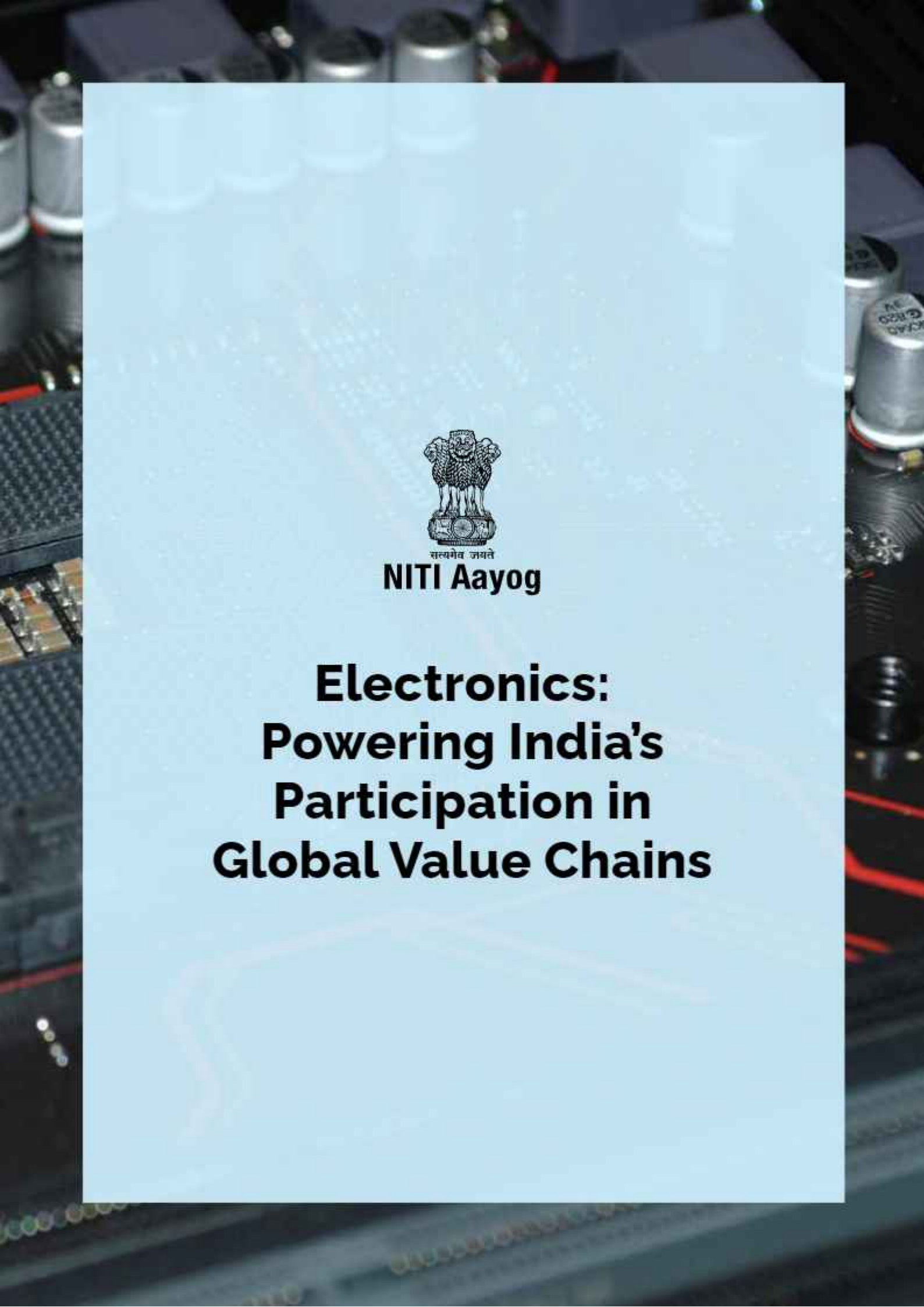
Electronics:
Powering India's Participation in Global Value Chains





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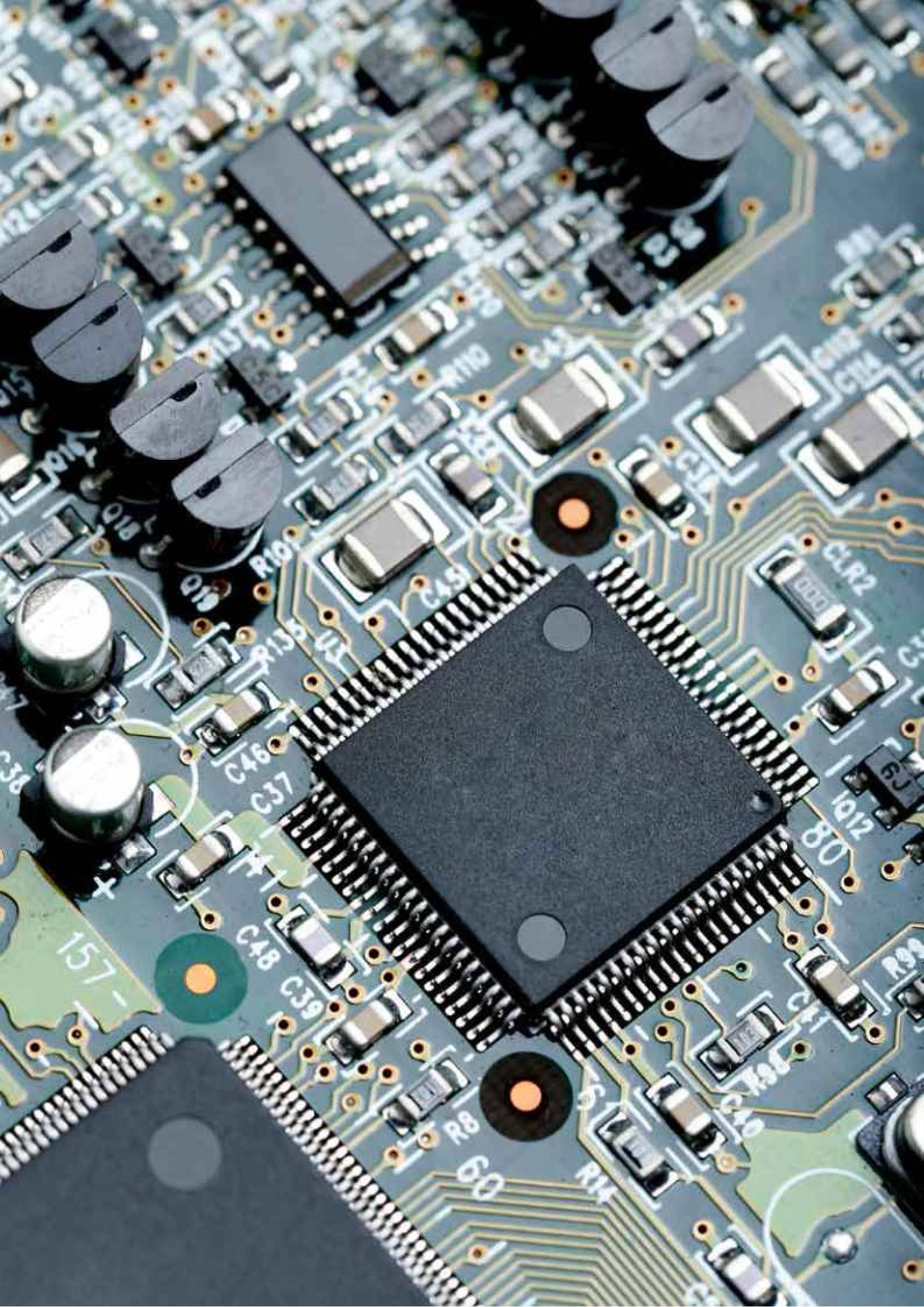
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MESSAGE
VICE CHAIRMAN
NITI AAYOG

सुमन के. बेरी
उपाध्यक्ष
SUMAN K. BERY
VICE CHAIRMAN
Phones : 23096677, 23096688
Fax : 23096699
E-mail : vch-niti@gov.in

भारत सरकार
नीति आयोग, संसद मार्ग
नई दिल्ली - 110 001
Government of India
NATIONAL INSTITUTION FOR TRANSFORMING INDIA
NITI Aayog, Parliament Street,
New Delhi - 110 001

Message

Amid increasing globalization, recent years have witnessed significant shifts in the way global producers and traders interact. Firms seeking to leverage factor endowments and competitiveness have driven the evolution of global production and trade networks, which are now structured around Global Value Chains (GVCs). These chains fragment different stages of the production process across the globe. Presently, approximately 70% of international trade involves GVC-related items, highlighting the urgent need for India to enhance its GVC engagement.

The electronics sector is particularly significant within GVCs, with nearly 80% of electronics exports generated through these global value chains. India is strategically positioned to capitalize on this opportunity, given the supportive domestic policy environment and favorable geopolitical climate. By focusing on strengthening its participation in electronics GVCs, India can unlock significant growth and development potential.

India's electronics sector has witnessed remarkable growth over the past five years, particularly in mobile phone manufacturing, which has surged by 22%. This growth has positioned India as a global hub for electronics production, showcasing the resilience and dynamism of our economy and the immense potential of the electronics industry. India's electronics manufacturing capacity is now projected to reach $300 billion by 2025-26. The government recognizes that GVCs will play a crucial role in expanding electronic manufacturing in the country. Although India's current GVC participation in electronics manufacturing is modest compared to global players, the country's participation has steadily increased, highlighting the potential for further growth.

NITI Aayog has taken an initiative 'Electronics Sector: Powering India's Participation in Global Value Chains' to address the aforementioned challenges in collaboration and consultation with various stakeholders including states and electronics firms. The key strategies and interventions to boost India's competitiveness in the electronics sector and facilitate its integration into global value chains are aimed to be identified in this comprehensive initiative.

The report further emphasizes the vital importance of strengthening India's capacities in design and component manufacturing to move up the value chain. While India has made substantial progress in electronic goods assembly and manufacturing, there is an urgent requirement to strengthen the ecosystem for design innovation and high-value component production.

To unlock the full potential of India's electronics sector, a range of measures are recommended to create an enabling environment for sustainable growth. In conclusion, I believe that this report on 'Electronics Sector: Powering India's Participation in Global Value Chains' represents a significant step towards achieving India's vision for the electronics industry, laying the foundation for future success and development.

(Suman Bery)

MESSAGE
MEMBER
NITI AAYOG

डॉ. वी.के. सारस्वत
Dr. V.K. Saraswat
सदस्य
Member
Tele : 23096566, 23096567
Fax : 23096603
E-mail : vk.saraswat@gov.in

भारत सरकार
नीति आयोग, संसद मार्ग
नई दिल्ली–110 001
Government of India
NATIONAL INSTITUTION FOR TRANSFORMING INDIA
NITI Aayog, Parliament Street
New Delhi-110 001

MESSAGE

India's manufacturing ecosystem is a cornerstone of its economic strategy, encompassing a diverse array of industries that contribute significantly to national growth, employment generation, and technological advancement. Among these sectors, the electronics industry stands out as a pivotal driver of India's manufacturing prowess and global competitiveness. Over the past decade, India has witnessed a concerted effort by the government to bolster its manufacturing capabilities through initiatives such as Make in India and the implementation of the Goods and Services Tax (GST). These measures have aimed to streamline regulatory frameworks, enhance ease of doing business, and attract both domestic and foreign investments into the manufacturing sector.

The electronics sector, in particular, has emerged as a linchpin of this strategy, propelled by a rapidly expanding consumer base, increasing digitalization across sectors, and a burgeoning middle class with rising disposable incomes. This sector encompasses a wide spectrum of products ranging from mobile phones and consumer electronics to industrial electronics, semiconductors, and electronic components. India's vision for the electronics industry extends beyond domestic consumption; it aims to position the country as a global manufacturing hub and a key player in the global supply chain for electronics.

The importance of the electronics sector transcends mere economic metrics. It is intricately linked to India's broader goals of fostering innovation, driving technological self-reliance, and creating sustainable employment opportunities. The sector not only fuels economic growth through production and exports but also catalyzes the development of ancillary industries such as logistics, packaging, and research and development (R&D). Moreover, advancements in electronics manufacturing contribute significantly to enhancing the country's technological capabilities and competitiveness in the global marketplace.

India's journey towards strengthening its manufacturing ecosystem, particularly in electronics, has been marked by significant achievements and

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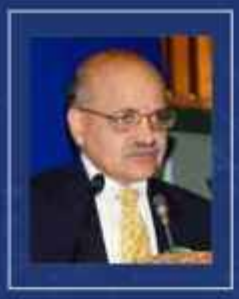
ongoing challenges. While the country has made remarkable strides in increasing domestic production and reducing import dependency in certain segments, challenges such as infrastructure constraints, skill shortages, and regulatory complexities continue to pose hurdles. Addressing these challenges requires a multi-pronged approach that includes targeted policy interventions, investments in infrastructure development, fostering industry-academia collaborations for skill development, and incentivizing R&D and innovation.

Looking ahead, India's strategy for the electronics sector emphasizes sustainable and inclusive growth, leveraging digital technologies to enhance productivity and efficiency across industries. The government's initiatives, including the Production Linked Incentive (PLI) scheme for electronics manufacturing, aim to attract investments, promote indigenous production, and create a conducive ecosystem for innovation and entrepreneurship. By harnessing the potential of its large consumer base, demographic dividend, and evolving technological landscape, India is poised to emerge as a global leader in electronics manufacturing, contributing significantly to the nation's economic prosperity and global stature in the years to come.

This report is laying down the roadmap for the country to achieve its electronics vision by 2030. I am hopeful that finding of this report will be useful in curating segment specific policies in the electronics manufacturing space.

(Dr VK Saraswat)

New Delhi
11.07.2024



MESSAGE
CHIEF EXECUTIVE OFFICER
NITI AAYOG

बी. वी. आर. सुब्रह्मण्यम
B.V.R. Subrahmanyam
मुख्य कार्यकारी अधिकारी
Chief Executive Officer

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नीति आयोग, संसद मार्ग
नई दिल्ली - 110 001
Government of India
National Institution for Transforming India
NITI Aayog, Parliament Street,
New Delhi - 110 001
Tel. : 23096576, 23096574
E-mail : ceo-niti@gov.in

MESSAGE

Over the past decade, the Government of India has initiated a series of transformative measures aimed at accelerating economic growth, enhancing competitiveness, and attracting investment across diverse sectors. From the landmark introduction of the Goods & Services Tax (GST) to the ambitious Make in India campaign, these initiatives have laid a robust foundation for fostering innovation, entrepreneurship, and sustainable development.

A notable example of the success of these efforts is evident in the remarkable growth of India's electronics sector, particularly in mobile phone manufacturing, which has seen a substantial 22% increase over the past five years. India has now established itself as a global hub for electronics production, underscoring the resilience and dynamism of its economy and highlighting the vast potential of the electronics industry.

However, despite these achievements, India's integration into Global Value Chains (GVCs) remains relatively modest compared to countries like China, Germany, and South Korea. With just a 3.3% share of global manufacturing output and manufacturing contributing 17% to GDP, there is a pressing need to intensify efforts to enhance India's role in the global electronics value chain.

Recognizing this imperative, NITI Aayog, in collaboration with various stakeholders, has launched a comprehensive initiative titled 'Electronics Sector: Powering India's Participation in Global Value Chains'. The primary objective of this initiative is to identify key strategies and interventions to boost India's competitiveness in the electronics sector and facilitate its integration into global value chains.

This initiative has involved rigorous research, consultations with stakeholders, and detailed analysis of industry trends and market dynamics. Through engagements with industry bodies, think tanks, academia, state governments, and key industry players, valuable insights have been gained into the challenges and opportunities facing the electronics sector.

A significant finding of this research underscores the critical need to enhance India's capabilities in design and component manufacturing to ascend the value chain. While India has made substantial progress in electronic goods assembly and manufacturing, there is an urgent requirement to strengthen the ecosystem for design innovation and high-value component production.

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To address these challenges, our recommendations encompass a comprehensive range of fiscal and non-fiscal interventions designed to create an enabling environment for sustainable growth. These include fiscal incentives to streamline manufacturing processes, as well as non-fiscal support for skill development and technology transfer, aimed at unlocking the full potential of India's electronics sector.

This report is presenting our findings and recommendations, thereby providing a comprehensive overview of our strategic roadmap for enhancing India's participation in the global electronics value chain. We firmly believe that by implementing these recommendations cohesively, India can realize its vision of achieving $500 billion in electronics production and $200-225 billion in exports by 2030, thereby generating millions of employment opportunities.

I acknowledge the efforts made by Shri Ishtiyaque Ahmed, Programme Director (Industry) and his team in NITI Aayog for developing such as insightful report on one of the most crucial sectors of the economy. The team have undertaken numerous stakeholder consultations and visits to firm up the contents of this report. I would also like to thank for the contributions and inputs provided by Industry Associations, Knowledge Partner, Central Ministries & Departments, Industry representatives and most importantly States.

As we embark on this transformative journey, we recognize the pivotal role to be played by the concerned Ministries/Departments of the Central and State governments in acting on these recommendations and making the vision of India becoming a manufacturing hub of electronics a reality.

[B.V.R. Subrahmanyam]

Dated: 15th July, 2024

MESSAGE
SENIOR ADVISER
NITI AAYOG

Ishtiyaque Ahmed,IRS
Senior Adviser
Tel : 011-23096816
E-mail : ahmed.i@nic.in

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भारत सरकार
नीति आयोग, संसद मार्ग,
नई दिल्ली-110 001
Government of India
NATIONAL INSTITUTION FOR TRANSFORMING INDIA
NITI Aayog, Parliament Street,
New Delhi-110 001

Message

India's economic growth trajectory has been exemplary in the last decade. It boasts itself to be the fastest growing major economy of the World. While the country's service sector has been the most important sector propelling India's growth, manufacturing sector has laid the foundation for the country's economic progress. However, our country's manufacturing prowess has been somewhat overshadowed by the technological advancements made by other Asian economies.

India's manufacturing contribution to GDP has hovered between 13-18% in recent past. Several policy reforms such as Make in India, Phased Manufacturing Programme, Production Linked Incentive schemes have been instrumental in providing the needed impetus to the manufacturing sector. Despite these efforts, there is adequate scope for India to improve its manufacturing footprints in global landscape.

To achieve the anticipated level of manufacturing in the country, it is imperative to leapfrog to sectors of high value. India's current expertize lies in traditional sectors like textile in which the products typically offer low value and high volume. The country need to maneuver its manufacturing capabilities in sectors such as electronics, which occupy upper echelons of the global value chain.

India's electronics sector has witnessed phenomenal growth in recent times, especially, in the mobile manufacturing segment. The import of mobile phones has come down drastically from 78% in 2013 to 4% in 2023. Parallely, the electronic production has achieved USD 101 Billion in value terms in FY 23, with exports clocking USD 24 Billion in the same period.

Despite these advancements, India faces many obstacles in integrating into higher value-added segments of the electronics value chain such as design, research and development (R&D), and manufacturing of critical components. Countries like China and South Korea dominate these stages due to their robust technological base and extensive infrastructure.

In order to bolster India's contribution to the global electronics value chain and achieve electronics production of USD 500 Billion by FY 30, investments in infrastructure, R&D, and skill development are crucial. Moreover, strengthening capabilities in design innovation, semiconductor manufacturing, and other high-value components will be pivotal in ascending the value chain and capturing a larger share of global electronics production.

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Fostering partnerships between industry, academia, and research institutions can facilitate technology transfer and cultivate innovation ecosystems within the country. Collaborative efforts to develop indigenous technologies and intellectual property will not only enhance India's competitiveness but also position it as a preferred destination for global manufacturers seeking to diversify their supply chains.

This report is the culmination of findings from numerous stakeholder consultations with industry, academia, industry associations, Ministries and Departments of Union Government and States. Field visits to electronics manufacturing units were separately undertaken to understand the nuances of the manufacturing process. I also acknowledge the association of our knowledge partner in this study. I am thankful to Hon'ble Vice Chairman, NITI Aayog and Dr. VK Saraswat, Hon'ble Member, NITI Aayog for their insightful suggestions and recommendations from time to time. I am also grateful to CEO, NITI Aayog for his continuous guidance and support throughout this initiative.

I sincerely hope that the recommendations presented in this report will benefit the industry in adopting suitable business strategies; and also help concerned Ministries/ Departments and state governments in developing favourable policies for the advancement of this sector.

(Ishtiyaque Ahmed)

Preface

Over the past decade, the Government of India has undertaken a series of initiatives aimed at bolstering economic growth. Measures such as the introduction of the Goods & Services Tax, liberalization of the FDI policy, initiatives like Make in India and Digital India, enhancements in Ease of Doing Business, implementation of the Bankruptcy Code, simplification of the tax regime and improved infrastructure have collectively spurred growth across various sectors. These efforts, complemented by sector-specific policies, have played a pivotal role in stimulating manufacturing activities across the nation.

Key manufacturing sectors such as Electronics, Automobiles, Bio-technology, Pharmaceuticals, Chemicals, Food Processing, Textiles, Steel, and Leather have all experienced robust growth rates across their respective segments. Electronics sector, particularly mobile phone manufacturing, has exhibited remarkable growth, with a sector -wise growth rate of 13% over the past five years, and a staggering 22% growth within the mobile phone segment alone.

Despite this promising growth trajectory, India's global presence remains modest. On the global manufacturing landscape, countries like USA, China, Germany, Japan and South Korea hold dominant positions, with China alone accounting for a substantial 28.4% share of the global manufacturing output. In contrast, India's share stands at a modest 3.3%, with manufacturing share contributing only 17% to its overall GDP. Similarly, in global electronics production, China is the dominant player with ~60% share, while India has an emerging but limited presence with only 2% share. In comparison, countries like Vietnam have managed to grow fast from ~0% to 4% share within a span of a decade. India's limited shares can be attributed to its relatively low participation in Global Value Chains (GVC) trade, with a predominant focus on traditional manufacturing sectors.

Currently, 70% of international trade comprises GVC items, emphasizing the critical need for India to enhance its GVC participation. This can be achieved by prioritizing sectors such as electronics, semiconductors, automobiles, chemicals, and pharmaceuticals, which play a significant role in the GVC landscape. Within GVCs, the electronics sector holds a significant position as nearly 80% of electronics exports come from GVCs.

Recognizing this imperative, NITI Aayog initiated the project 'Powering India's Participation in Global Value Chains,' with a primary focus on the electronics sector. The project involved extensive analysis and secondary research, along with stakeholder consultations spanning several months, were conducted. Stakeholders included industry

bodies such as CII, FICCI, ELCINA, ICEA, MAIT; think tanks/academia including ICRIER, Centre for Development Studies, ISID; States of Maharashtra, Haryana, Karnataka, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh and Tamil Nadu; top electronics firms such as Apple, Samsung, Lava Mobiles, Dell, JABIL, Flex Electronics, Dixon Electronics, Wistron, Pegatron, Padget Electronics, Tata Electronics, Micron, VVDN, Deki Electronics, Foxconn Bharat FIH, Nokia, Salcomp; and Central Departments and Ministries including MeitY, Department of Telecommunications, DPIIT, Ministry of Skill Development, and Ministry of Heavy Industries.

Drawing upon the findings of such comprehensive research and stakeholder engagements, this report has been meticulously prepared. This report is result of immense contribution made by our stakeholder Ministries/Departments, States, Industry, Industry bodies and think tanks. Ministry of Electronics & Information Technology (MeitY) has all along been associated in the project and provided valuable and pragmatic suggestions. Shri Ajai Chowdhry, Distinguished Fellow, NITI Aayog has greatly helped in firming up the recommendations, providing insightful feedback and expertise that have significantly shaped the final outcomes.

This report identifies the challenges impeding India's presence in electronics GVCs, opportunities and facilitators to enhance its position in the global landscape, as well as global success stories and benchmarking. It identifies where India needs to intervene in terms of the segments, components, and sub-systems to target, as well as which parts of the Value Chain to focus on. It also offers detailed recommendations with action steps across multiple domains such as fiscal measures, regulatory reforms and ease of doing business, hard infrastructure, soft infrastructure, skill development and labour issues, and R&D and design ecosystems. The report is expected to serve as a comprehensive guiding document for government and industry stakeholders to power up India's participation in Global Value Chains in the electronics sector.

Executive Summary

Manufacturing plays a crucial role in a country's economy. Historically, manufacturing has been the engine of growth of all major economies, driving their per capita income and export earnings. It has also been a steady source of inclusive employment for highly skilled, skilled and unskilled workers.

An economy usually traverses from initial predominance of the primary/agrarian sector to the manufacturing /secondary sector, and then to a dominant tertiary sector across its growth trajectory. India's story has been different. The country, across its growth path, has travelled from being an agrarian economy to a service-led economy, while the contribution of manufacturing has been fairly constant across the journey. India's manufacturing contribution to GDP has hovered between 13% to 18%, for a substantial period.

Further, India's share in global manufacturing is relatively modest compared to leading manufacturing powerhouses like China and the USA. Although India holds a significant position with a total manufacturing output valued at US$ 457 billion, it accounts for only 3.3% of the world's manufacturing output.

Within manufacturing, electronics is one of the most important sectors in terms of its market size, export potential and employability. The electronics market is estimated at US$ 4.3 trillion globally and at US$ 155 billion in India (2022). Electronics products are among the world's top exports. In FY23, India's electronics sector recorded a significant value of exports, contributing a considerable share of 5.32% to India's total merchandise exports. The sector's export performance highlights its competitiveness in the global market and its ability to capitalise on international demand. It has also enhanced India's position in the global electronics landscape.

The electronics sector is very high in terms of GVC participation, with over 75% of electronics exports being part of GVCs. It is not confined to a particular country or economy and is spread across several geographies and firms. For example: components for iPhone are sourced from multiple countries including the USA, China, Japan, Korea, Taiwan, and European nations. The core design of the iPhone originates from the United States. Essential rare earth minerals for the iPhone are predominantly mined in China. Countries like Japan, Korea and Taiwan play significant roles in supplying critical parts, such as LCD panels, microchips, and memory. European countries contribute advanced components like gyroscopes. The end products i.e. iPhones, are finally assembled in countries like India, China, and Vietnam.

Global electronics trade volumes are estimated at US$ 3 trillion. However, India's participation is low at <1% share, despite ~4% share of global demand. Vietnam exports nearly 6 times of India. Presently, India's electronics manufacturing primarily involves the final assembly of electronic goods. While brands and design firms have started increasingly outsourcing assembly, testing, and packaging tasks to Electronic Manufacturing Services (EMS) companies in India, the ecosystem for design and component manufacturing is at a nascent stage.

On account of variety of factors, India's electronics manufacturing faces a cumulative cost disability of 10%-14% for assembly, and 14%-18% for components manufacturing. Tariffs and material costs result in a 5%-6% disadvantage for assembly and 4%-5% for components compared to China due to the high cost of inputs. China has a clear advantage due to the local presence of components and sub-assembly ecosystem. Logistics costs contribute an additional 2%-3% disability, while high finance costs add 1%-2.5% for assembly and up to 4% for components. On the other hand, India's major competitors like China, Vietnam, Malaysia and Taiwan have turned themselves into attractive destinations for electronics manufacturing for leading global firms, by providing various tax cuts, tariff cuts, skilling and other incentives. Complete details of fiscal disability for electronics production are given in the report.

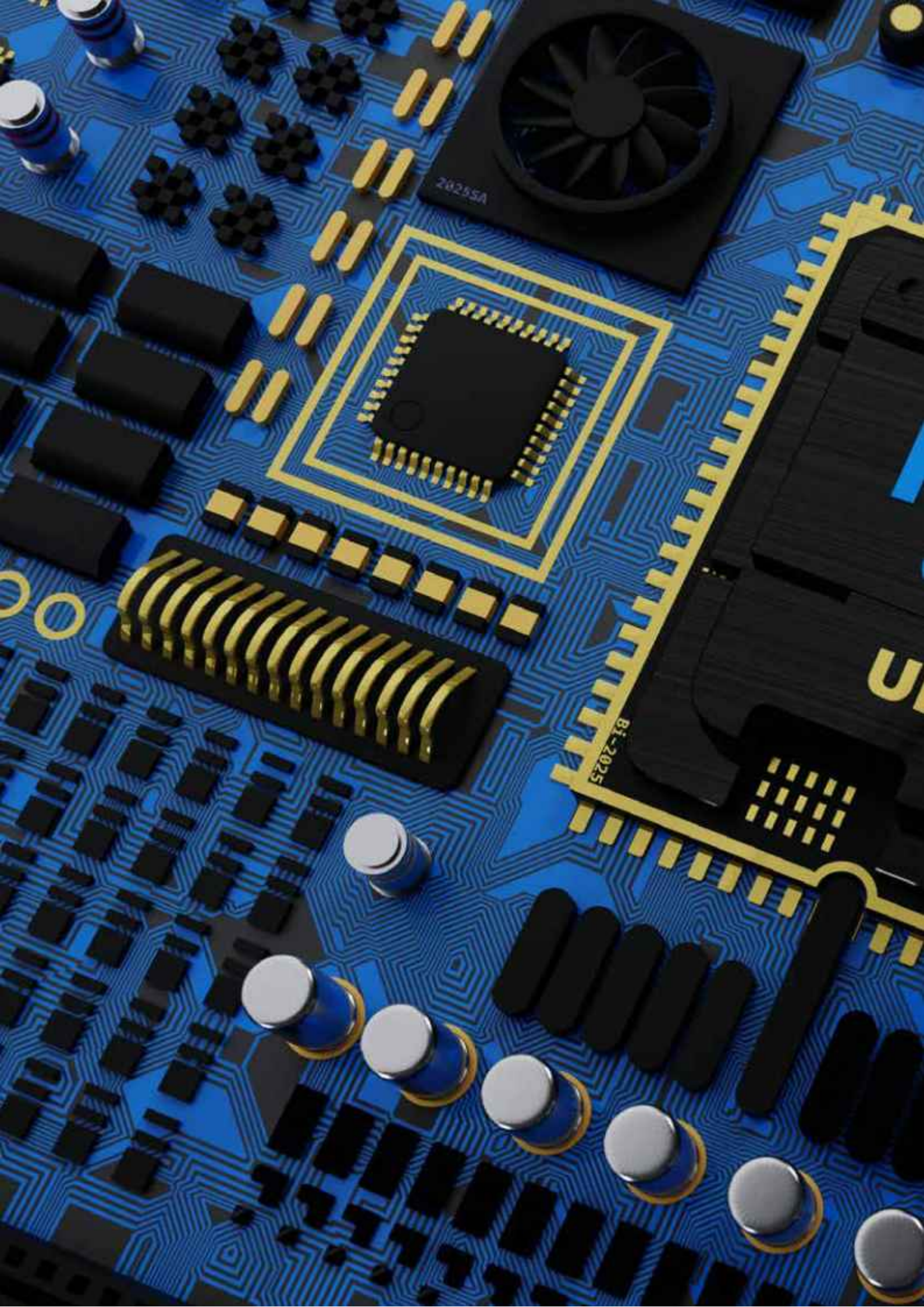
Despite challenges, the sector holds immense opportunities for India. In FY23, domestic electronics production surpassed US$ 101 billion, growing at an impressive rate of nearly ~ 15% annually. Within electronics, the mobile phone segment has seen phenomenal growth in the last 10 years, with estimated production growing 19 times in value and imports reducing from 78% in 2014 to 4% in 2023. The growing electronics production in the country, large global and domestic market sizes, as well as geopolitical dynamics with respect to China, provide an opportune time for India to power up electronics manufacturing and design through an ambitious long-term strategy for the sector.

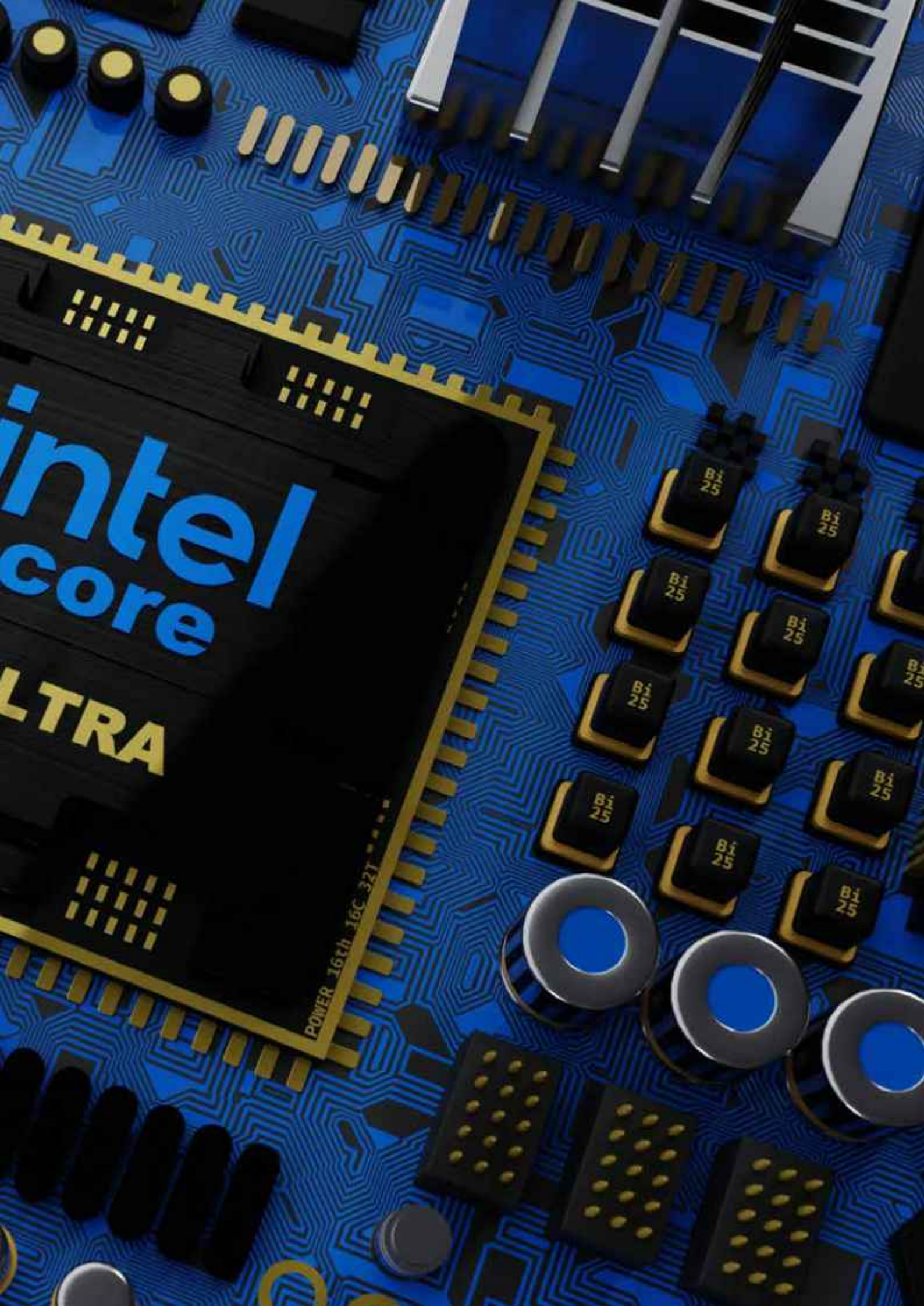
This report envisions India advancing to US$ 500 billion in electronics production with US$ 200-225 billion in exports by 2030, wherein both finished goods and components are expected to play key roles. Finished goods and components are likely to contribute ~ US$ 350 billion and ~US$ 150 billion respectively in production. This is expected to lead to the generation of large-scale employment opportunities to the tune of 5.5 to 6 million by 2030. However, this ambitious vision can be attained only through focused policy interventions.

The report recommends a range of interventions across multiple domains. It identifies where to intervene, e.g. which segments, components, or sub-systems to concentrate on, which parts of the Value Chain (design, sub-component manufacturing, assembly, R&D, etc.) to focus on, etc. Strategic interventions are recommended across multiple domains, such as fiscal, financial, trade promotion, technology transfer, regulatory reforms, ease of doing business, hard infrastructure, soft infrastructure, skill development and labour issues, and R&D and design ecosystems.

Effective interventions must encompass both fiscal and non-fiscal measures. Fiscal support entails operational expenditure (Opex) aid to scale up the manufacturing of low-complexity or locally-produced components such as casings, glass, etc. It also entails capital expenditure (Capex) support for high-complexity components like mechanics, capital goods, special components (SMD grade), and Lithium-Ion cells. Hybrid support is crucial for high-complexity components, covering SMD grade, 8 layer+ PCB, passives, etc. Furthermore, fostering the development of product/design ecosystems and scaling up industrial infrastructure is vital. Non-fiscal support primarily involves simplification and rationalization of tariffs and taxes, along with initiatives for skilling and streamlining the process of technology transfer and enhancing Ease of Doing Business (EoDB).

Timely and effective implementation of the recommended reforms and new initiatives offers a promising and powerful route for India to boost its GVC participation in the electronics sector, and thus achieve accelerated economic growth, income generation, job creation, improved ecosystems and ancillaries, as well as opportunities for skill and knowledge advancement.

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Chapter 1

INTRODUCTION

Chapter 1
INTRODUCTION

1.1 Global Manufacturing Landscape

1.1.1 Manufacturing has historically been a cornerstone of economic growth and global economic dominance of countries. In addition to providing substantial employment across diverse skill levels, the manufacturing sector supports both individual livelihoods and broader economic stability through a multiplier effect, which stimulates demand for related services and industries. Manufacturing is also central to international trade, with countries that possess strong manufacturing capabilities playing pivotal roles in the global market.

1.1.2 The global manufacturing landscape has undergone significant transformation over the past 24 years, with value addition in manufacturing increasing by more than 2.5 times since the 2000s. In 2022, the global value addition in manufacturing stood at US$ 16.19 trillion and is largely occupied by China, which accounts for 28.4% of the share in global manufacturing output. It is followed by the USA (16.6%), Japan (7.2%), Germany (5.8%), India (3.3%), South Korea (3%), Italy (2.3%), UK (1.8%) and France (1.9%).

1.1.3 India's share in global manufacturing is relatively modest compared to leading

manufacturing powerhouses like China and the USA. Although India holds a significant position with a total manufacturing output valued at US$ 457 billion, it accounts for only 3.3% of the world's manufacturing output.

Table 1: Global Manufacturing Landscape

India has moderate share in global manufacturing

Country	Total value of manufacturing output (USD)	% Share in World Manufacturing	Manufacturing as % of GDP
China	4.9 Tn	28.4	27.7
USA	2.5 Tn	16.6	10.3
Japan	1.0 Bn	7.2	19.2
Germany	751 Bn	5.8	18.4
India	**457 Bn**	**3.3**	*** 17.7**
South Korea	426 Bn	3.0	25.63
Italy	283 Bn	2.3	14.9
France	265 Bn	1.9	9.5
UK	259 Bn	1.8	8.4

Source: World Bank, World Population Review, Note: Data as of 2022, Brookings, MoSPI

1.2 Manufacturing Landscape of India and Significance of Electronics Sector

1.2.1 India's manufacturing capabilities span a wide range of industries, including textiles, chemicals, electronics, automotive, and machinery. Among these, the electronics sector is one of the world's largest and fastest growing industries, and has also emerged as having growing significance for India. The sector has a market size of US$ 155 billion in India. Domestic production of electronics doubled from 2017 to 2022, and the sector has had a high CAGR of 13% over the past five years. This growth can be attributed to several factors, including increased domestic consumption, advancements in technology, and supportive government policies.

1.2.2 The electronics sector has demonstrated exceptional performance among India's top 10 export sectors in recent years, rising from rank 9 in the year 2018 to rank 6 in 2022. In FY23, the electronics sector recorded significant value of exports, contributing a considerable share to India's total merchandise exports clocking US$ 23.5 billion. The sector's export performance underscores its competitiveness in the global market and its ability to meet international demand. This success in exports not only brings in foreign exchange but also enhances India's reputation as a key player in the global electronics landscape.

1.2.3 This sector's impressive metrics highlight its critical role in the country's economic landscape and underscore the importance of focusing on its continued growth. Importantly, the sector holds immense opportunity

*As per World Bank, India's share of manufacturing GDP is 13%, MoSPI's data on share of manufacturing is 17.7%.

for India driven by factors such as COVID-led supply chain diversification; geopolitical advantages especially following chip and chip-manufacturing equipment export restrictions on China by multiple countries; large working-age population in India, rising cost of labour in China; and growing demand for integrated circuits and semiconductors as a consequence of India becoming a global export hub of mobile phones. Additionally, India also has a high-potential domestic market for consumer electronics, being the world's most populous country with a favourable demographic profile that comprises aspirational and tech-savvy youth with growing purchasing power.

1.2.4 The electronics sector is also at the forefront of technological innovation, driving advancements that have far-reaching impacts on other industries. Its sectoral growth in India can be further enhanced through participation in global value chains.

1.3 Global Value Chains (GVCs)

1.3.1 In the current era, manufacturing has modernized by leaps and bounds with Global Value Chains playing a crucial role in this transformation. GVCs are international production sharing, where the full range of activities (i.e., design, production, marketing, distribution and support to the final consumer, etc.) are divided among multiple firms and workers across geographic spaces, to bring a product from conception to end-use and beyond.

1.3.2 The concept of global value chains has evolved significantly over time, mirroring the changing landscape of international trade theory. This evolution traces back to David Ricardo's 1817 theory of comparative advantage, which suggested that countries benefit by specializing in goods where they have a cost advantage. Hecksher and Ohlin later expanded this by arguing that trade patterns are shaped by countries' varying factor endowments, leading to specialization based on labor or capital intensity. In the 1980s, Paul Krugman's new trade theory posited that even similar countries could benefit from trade through specialization and economies of scale. This theory also emphasized geographical proximity and the development of industrial clusters due to reduced transportation costs and agglomeration effects.

1.3.3 The new trade theory focuses on differences between individual firms within the same industry. It highlights that the most productive firms are more likely to engage in international trade and investment, leading to increased productivity, higher wages, and improved living standards. It underscores that the trade benefits stem not only from differences between countries or industries but also from variances within industries, driven by unique firm-specific technologies or intellectual properties.

1.3.4 Building upon these theoretical foundations, the concept of GVCs emerged. GVCs elucidate how firms integrate into global markets, whether by producing

their own inputs or sourcing them internationally, and how they manage various functions like human resources and accounting across different locations. Essentially, GVCs are a mechanism where the production of finished goods is broken into activities and tasks carried out in different countries based on cost efficiencies and specialization. As an implication, firms and countries engage in GVCs in specific tasks and stages of production rather than producing the whole product.

1.3.5 The concept of GVC can be better explained by taking the example of an electronics product such as an iPhone. This product is a result of global collaboration, with components sourced from multiple countries including the USA, China, Japan, Korea, Taiwan, and European nations. The core design, engineering and several key components of the iPhone originate from the United States. Essential rare earth minerals for the iPhone are predominantly mined in China. Countries like Japan, Korea and Taiwan play significant roles in supplying critical parts such as LCD panels, microchips, and memory. European countries contribute advance components like gyroscopes. The end products, i.e., the iPhones, are finally assembled in countries such as India, China, and Vietnam. GVC in an iPhone at assembly level is illustrated in the following manner:

Exhibit 1: GVC for Assembly of Mobile Phone (illustrative)

Source: Project Analysis

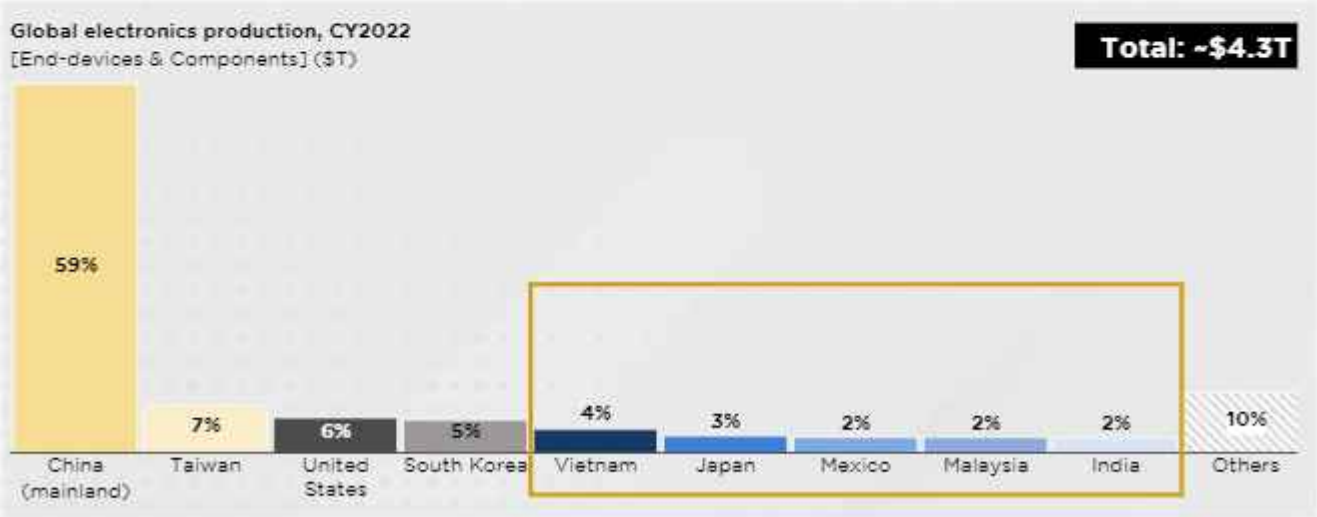
1.3.6 GVCs offer an appealing option for countries seeking to industrialise, as they no longer need to create full products or value chains. Countries can create targeted industries, and just insert themselves into particular stages that suit them in the Value Chain. This raises prospects of countries to rapidly achieve economies of scale and produce for exports. GVC participation is thus a promising and powerful route to achieve accelerated economic growth, job creation, income generation, tax revenues, improved ecosystems and ancillaries, as well as opportunities for knowledge transfer.

1.4 GVCs in Electronics Sector

1.4.1 Within global value chains, electronics manufacturing plays a vital role, underpinning an array of segments from smartphones in our pockets to electric vehicles on the road. The global electronics market is estimated at US$ 4.3 trillion. The electronics GVC is intricate, with a select group of nations – China, Taiwan, the USA, South Korea, Vietnam, Japan, Mexico, and Malaysia – participating in different stages of manufacturing and exerting significant control over the supply chain. These countries collectively drive >90% of overall US$ 4.3 Trillion electronics production[1].

1.4.2 China is the world's largest electronics producer, accounting for nearly 60% of worldwide electronics production. Taiwan, USA, and South Korea are other mature producers, each accounting for 5%-7% share of the global output. Vietnam, Mexico, Malaysia, and India are emerging centres in the electronics market[2]. The Exhibit below illustrates the dominance of China and new emerging geographies like Vietnam, Malaysia, Mexico and India in the electronics GVC:

Exhibit 2: Global Electronics Production (2022)



Source: S&P Global

[1] S&P Global – HIS Markit Database
[2] S&P Global – IHS Markit Database

1.4.3 A closer look at trade shows that the worldwide electronics trade flow is estimated at US$ 3 trillion. China dominates global electronics exports with a ~30% share, followed by Taiwan (~9% share) and the USA (~7% share). Vietnam and Malaysia are emerging centres in the electronics market and account for a significant ~4% share of global electronics exports[3]. On the other hand, India's share in electronics GVC remains small, at less than 1%, with annual exports of ~US$ 25 billion[4]. The following Exhibit captures the export and import figures of key countries in the GVC of the electronics sector:

India's participation in GVC is low, at <1% share share in ~$3T electronics trade flow globally. Vietnam exports ~6X of India

India's could target to 5-6% of $4T Electronics GVC ($200-250Bn exports) by 2030

Source: S&P Global, UN COMTRADE

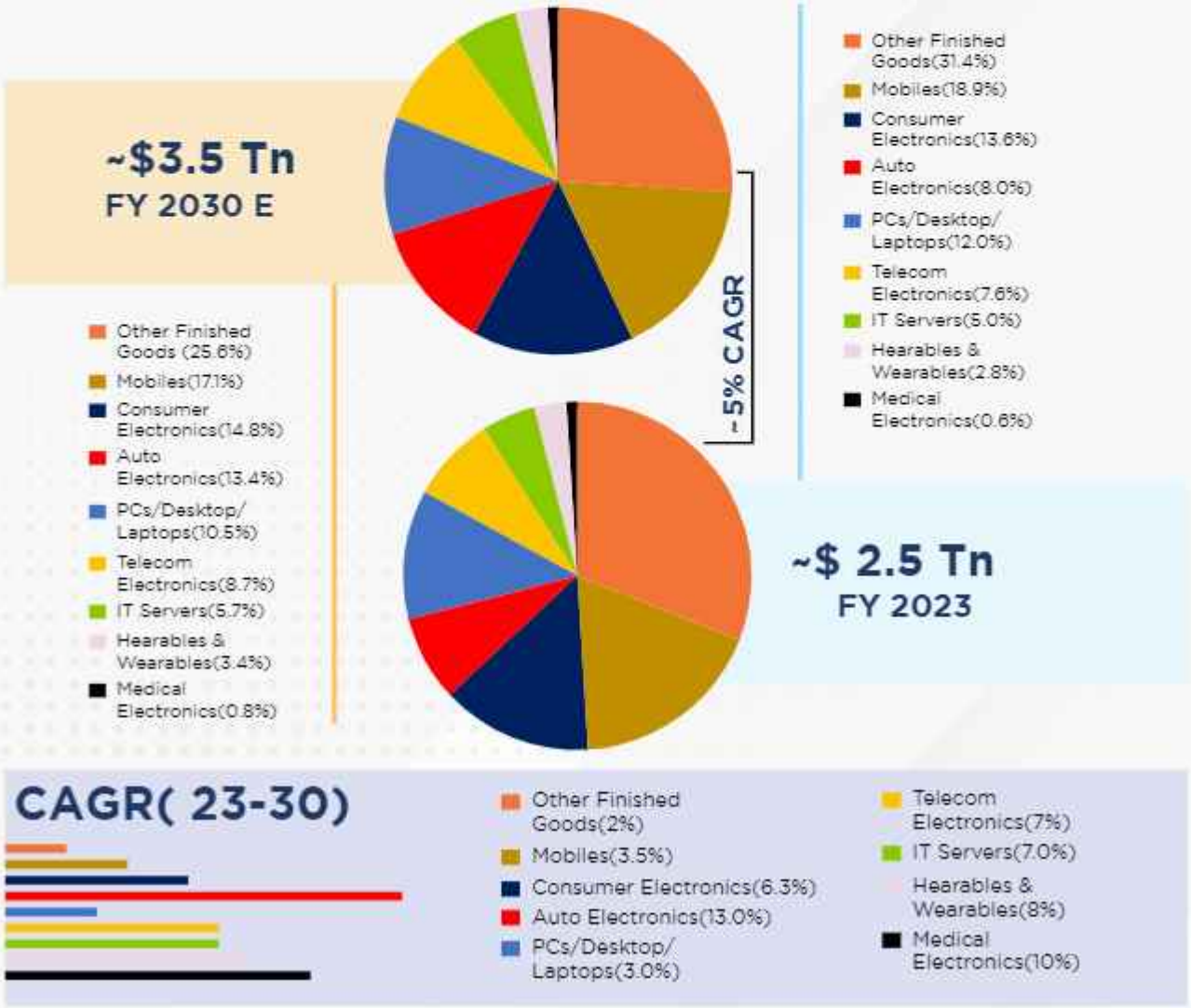
[3] S&P Global, UN COMTRADE

[4] MeitY

Exhibit 3: Global Electronics Trade and Imports-Exports of Key Countries (2022)

1.4.4 The overall electronics value chain can be categorized into finished goods and components. Of the total US$ 4.3 trillion electronics market, the demand for finished goods market is estimated at ~US$ 2.5 trillion. Among the finished products, smartphones (~US$ 470 billion), consumer electronics (~US$ 340 billion), and PCs/Laptops/Notebooks (~US$ 300 billion) are the most significant mass-market segments, accounting for ~45% of the market. Auto, Telecom, and Servers are the biggest B2B segments. Other segments, such as industrial, strategic, IoT, aerospace, etc., make up the rest of the market. The finished product segment is presently valued at US$ 2.4 trillion and is expected to reach at US$ 3.5 trillion by 2030. Top segments in this space are likely to be mobiles, consumer electronics, auto electronics, PCs/Desktops and telecom electronics. Segment wise market share as on 2023 and expected share in 2030 are given in the following Exhibit:

Exhibit 4: Global Electronics Market FY23 (Finished Products)



Note: Other Final goods include industrial, strategic, LED, Aerospace, IoT, etc.
Source: Project Analysis, S&P Global, IDC, Gartner

1.4.5 On the other hand, the global components market is estimated at US$ 1.8 trillion. Of this, ~US$ 1.4 trillion are electronic components and modules, comprising multiple groups such as PCB, Passives, Antennas, Sensors, Display, Camera, Battery, Electro mechanicals, etc. and ~US$ 400 billion is contributed by mechanicals and composites[5]. This segment can be divided into five parts namely; i) Non-SMT grade components and others, ii) SMT grade components, iii) Displays, iv) Active SMT grade components and v) Mechanical and composites. Details of these categories of components and their present market share are given in the following Exhibits:

EXHIBIT 5: GLOBAL ELECTRONICS COMPONENT MARKET (FY23)
OVERALL ELECTRONICS COMPONENTS MARKET, FY23: $1.8 TRILLION

Exhibit 5a: Non SMT grade and SMT grade

Non-SMT grade, and other components	US$ B 370-400
Low tech Passives	20-25
PCB (<8 layers)	30-35
Antennas	5-10
Electromechanical components (e.g., connector, switch, sensors, actuators)	115-125
Other components (e.g., wire harness, cables, battery circuits, keypads, USB, other components)	200-210

SMT Grade (incl. actives)	US$ B 275-310
SMT-grade passives (e.g., Ceramic capacitors)	30-35
Complex Sensors	15-20
Diodes, LED	70-75
Transistors	10-15
Antennas	10-15
8+ layers PCBs	45-50
Other IC Chips (e.g., power mgmt. chip, audio controller, etc.)	95-100

[5] S&P Global, Gartner, Markets & Markets, Project Analysis

Exhibit 5b: Display and Active (SMT) grade components

Display	US$ B 120-130
Touch panel components (including open cells, cover glass, polarizer / color filters, Fingerprint on Display etc.)	
Other display components (e.g., gate driver ICs, source driver ICs, sensors, backlight, etc.)	
Other components	80-90
Camera components (Lens, Actuators, Sensors, etc.)	30-35
Li-ion Battery cells	50-55

Active (SMT Grade)	US$ B 510-530
Microprocessor (Logic)	235-240
Memory (DRAM)	165-170
Storage (HDD/SDD)	50-55
MOSFET/JFET	60-65
Power electronics EVs (e.g., Power MOSFET, thyristor etc.)	
RF Power (5G)	

Exhibit 5c: Mechanicals & Composites Market, FY23

Mechanicals & Composites	US$ B 400
Mechanical & Composites (e.g., Casings, Housings, Glass, Keypad, etc.)	400

Source: S&P Global, Gartner, Markets & Markets, Project Analysis

1.5 Outlook

1.5.1 The global electronics finished goods market is expected to grow at ~5% CAGR and reach ~US$ 3.5T by FY30. This growth is primarily driven by a rise in per capita consumption of electronics, especially in fast-growing developing economies, premiumization, and the emergence of new product categories. Electronic producers have been diversifying their supply chains beyond China driven by geopolitical and macro-economic factors such as concerns over excessive concentration risks as observed during COVID-related disruptions, ongoing trade tensions between China-USA, and China-Taiwan and diminishing labour cost advantages in China pushing electronics producers to seek alternate low-cost manufacturing hubs.

1.5.2 India, supported by favourable demographics such as a young population, an expanding middle class, and government investments under Phased Manufacturing Programme (PMP), Production Linked Incentive Scheme (PLI), Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS), etc., is poised to benefit from this opportunity. However, countries like Vietnam, Mexico, and Malaysia pose tough competition, as they have successfully managed to attract sizable shares of electronics manufacturing to their soils. For instance, mobile and hearable/wearable manufacturing is shifting to Vietnam, and there has been an increase in the manufacturing of IT hardware and TVs in Mexico, among others. If countries like Vietnam and Mexico solidify their positions, it would become significantly more challenging for India to displace them to become a key player in electronics GVC . Therefore, there is an urgent need to capitalize on this opportunity. India must act swiftly and target a 4%-5% share in global electronics exports by 2030[6].

[6] Project Analysis

Chapter 2

STATE OF INDIA'S ELECTRONICS MANUFACTURING

Chapter 2
STATE OF INDIA'S ELECTRONICS MANUFACTURING

2.1 Growth of the Electronics Sector in India

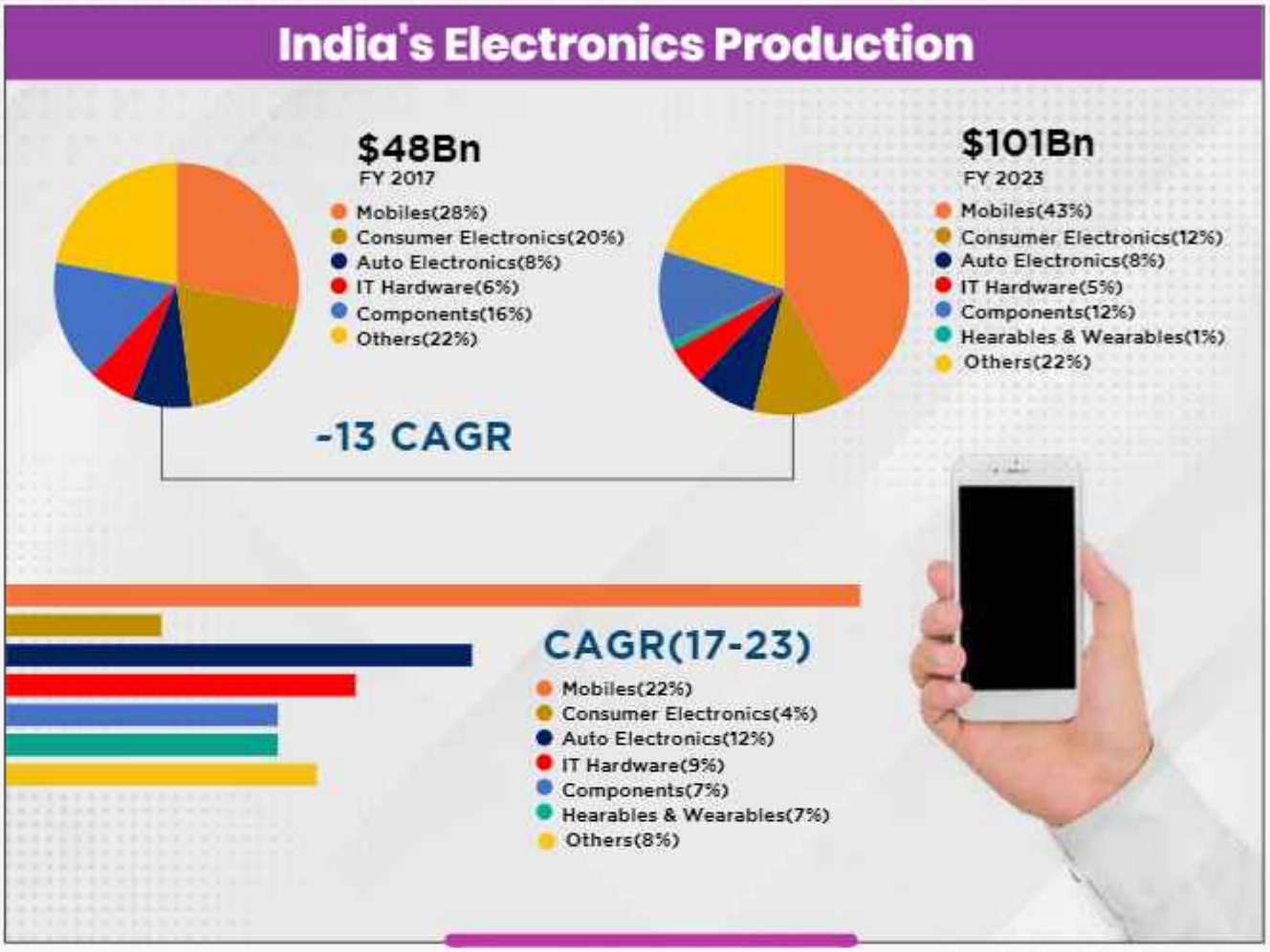
2.1.1 India's electronics sector has emerged as a beacon of growth and has dominated exports in the last five years. In FY23, India's electronics market stood at US$ 155 billion. The electronics sector's production has nearly doubled between FY17 (~US$ 48 billion)[7] and FY23 (~US$ 101 billion), registering a CAGR of nearly 13%. This growth has primarily been driven by mobile phones, which constitute ~43% of the overall electronics production.

Remarkably, during this period, India has transitioned from importing ~80% of smartphones to a current scenario where ~99% of smartphones sold in India are domestically manufactured[8]. Auto-electronics, on the other hand, have registered the second-highest CAGR of 12% during FY17-23. India's electronics sector segment wise is depicted in the Exhibit 6:

[7] MeitY

[8] Fortune India article titled "99% of Mobiles sold in India are 'Made in India': FM

Exhibit 6: India's Electronics Production



Source: MeitY Annual Report

2.1.2 This progress has been facilitated by a range of government policy initiatives and programs such as Make in India, Digital India, Phased Manufacturing Program, promotion of manufacturing of electronic components & semiconductors and production-linked incentives, among others. These initiatives are designed to stimulate domestic manufacturing and attract foreign investments. Some notable schemes offer incentives covering product segments such as mobiles, consumer electronics, IT hardware, telecom, and auto electronics. However, not all schemes have achieved similar levels of success. PLI for Large-scale electronics manufacturing has been most effective in attracting broad-based investments from both global and domestic players. Other PLIs, such as those for IT Hardware and Telecom, have yet to make a significant impact in their respective sectors.

2.1.3 The government has undertaken a number of measures targeted to address the entire ecosystem of electronics manufacturing in the country. India Semi-conductor Mission will aid the entire spectrum of electronics manufacturing

i.e. mobiles, consumer electronics, telecom products, IT hardware and auto electronics. PLI schemes on large scale electronics, automobiles, IT hardware, telecom and networking products, and white goods, incentivise the production of products in their specific segments. FAME II has been one of the important policy interventions in the automobile sector and has created a tailwind for the growth of auto electronics. Scheme for Promotion of Manufacturing of Electronics Components & Semiconductors (SPECS) has been instrumental in establishing green field projects. Further, schemes like the Electronic Cluster Manufacturing (EMC) Scheme and the Electronics Development Fund (EDF) are meant to improve infrastructure and develop the Electronics System Design and Manufacturing (ESDM) respectively, of the sector in India. These initiatives can be seen in the following Exhibit:

Exhibit 7: Coverage of India's Electronics Schemes across sectors

Scheme	Mobile	Consumer Electronics	Telecom	IT Hardware	Auto electronics
Semicon India Program (Semicon, Display Fabs, Design-linked Incentives)	✓	✓	✓	✓	✓
PLI for Large scale electronics manufacturing[1]	✓	✓	✓	✓	✓
PLI for Automobile and auto components					✓
PLI for IT hardware 1.0 and 2.0				✓	
PLI for Telecom and Networking equipment			✓		
PLI for White Goods		✓			
FAME II					✓
Promotion of Manufacturing of Elec. Components & Semiconductors (SPECS)	✓	✓	✓	✓	✓
Electronic Cluster Manufacturing (EMC) Schemes I & II	✓	✓	✓	✓	✓
Electronics Development Fund (EDF)	✓	✓	✓	✓	✓

Source: Project Analysis, PLI Notifications

2.1.4 India's domestic demand for electronics currently stands at ~US$ 155 billion (FY23) and has been growing at ~15% CAGR[9]. Despite this rapid growth in domestic demand, India's electronics market remains relatively small, constituting only ~4% of global electronics, projected to reach ~6% by 2030[10]. Further, India's share in electronics GVC remains small, at less than 1%, with annual exports of ~US$ 25 billion. This stark reality underscores the need to pivot its focus towards capturing global demand and adopting an export orientation.

Presently, India's electronics production primarily involves the final assembly of electronic goods. While brands and design firms have started increasingly

[9] Invest India – Electronics Systems and Design

[10] Project Analysis

outsourcing assembly, testing, and packaging tasks to Electronic Manufacturing Services (EMS) companies in India, the ecosystem for design and component manufacturing is at a relatively nascent stage.

2.2 India's Presence across the Electronics Value Chain

2.2.1 Based on production, the electronics value chain can be divided into 4 categories:

a. Design Players/ Original Design Manufacturers (ODM): The design players/ ODMs usually have strong design and prototype capabilities as their core business. They often sell their products to multiple clients, allowing them to market products under their brands.

b. Components Makers: There are two types of component makers –

i. Build to Print (B2P): These businesses manufacture components as per an OEM's specifications

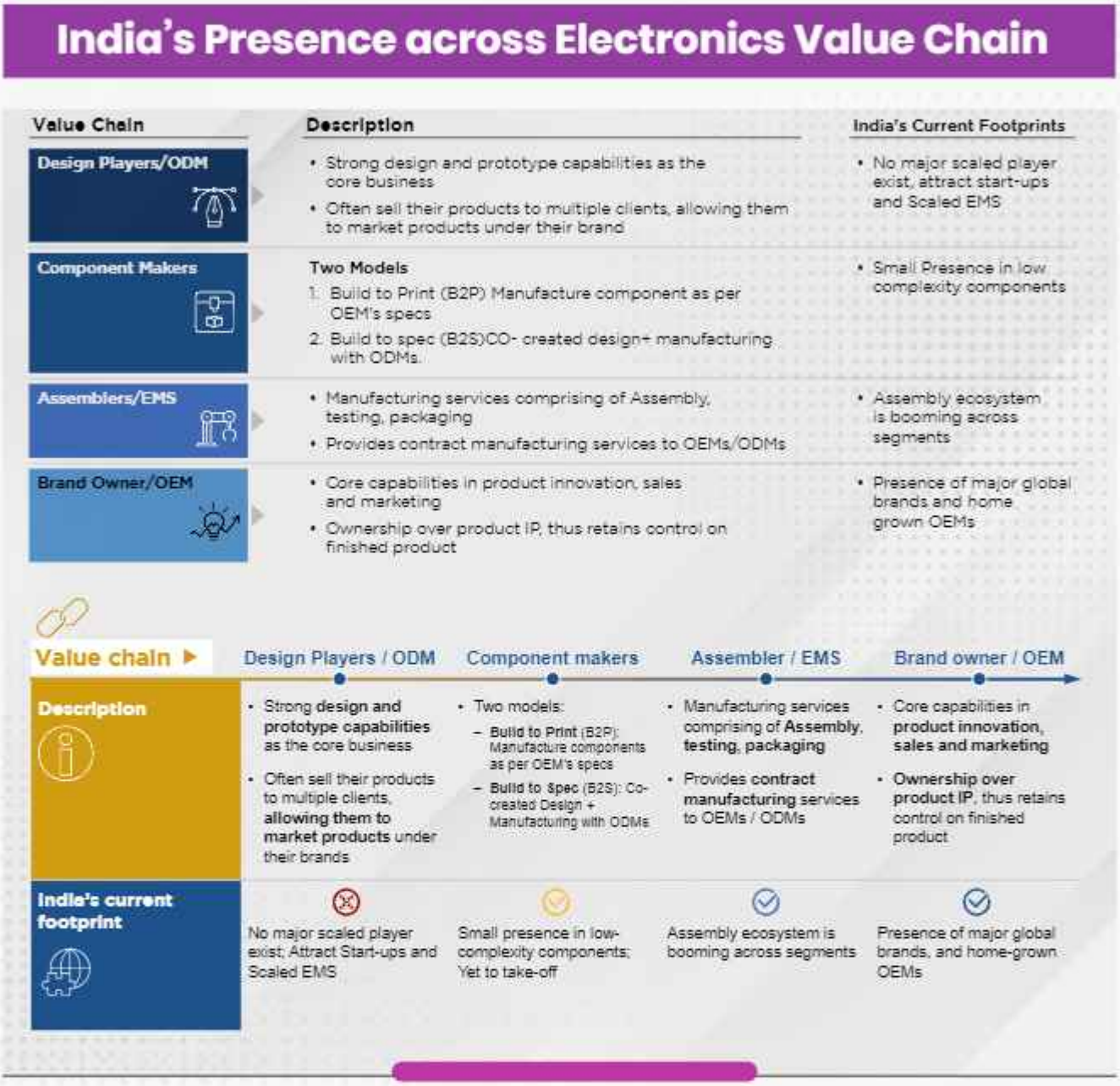
ii. Build to Specification (B2S): These businesses co-create designs and manufacture with ODMs

c. Assemblers / Electronics Manufacturing Services (EMS): Assemblers are usually contract manufacturers of OEMs/ODMs. They provide manufacturing services comprising assembly, testing and packaging.

d. Brand Owner/ Original Equipment Manufacturers (OEMs): OEMs are companies that produce components that are used in another company's end products. Their core capabilities are product innovation, sales and marketing. Due to the ownership of product IP, the OEM usually retains control of the finished product.

2.2.2 India has significant presence and capabilities of assemblers and OEMs in the electronics value chain. Assemblers in India include players like FOXCONN, Dixon, Amber and Pegatron. Samsung, Apple, Boat and Atomberg. India has a negligible presence in component manufacturing, with a small presence in low-complexity component manufacturing. India's domestic ecosystem of components is limited to the manufacturing of specific low-tech and low-complexity components like cables, connectors, electro-mechanicals, and mechanicals. Most high-tech components continue to be imported. Over time, the entry of both global and Indian manufacturers in the EMS space is expected to drive the push for backward integration into indigenous design and product development. There is ample opportunity for India to establish itself as a key player in the electronics GVC, spanning the entire value chain from design to components and assembly. Participation of India in the value chain of the electronics sector is shown in the following Exhibit:

Exhibit 8: India's Presence across Electronics Value Chain



Source: Project Analysis

2.2.3 A deeper product analysis of India's presence in the electronics value chain as explained below, reveals that while India has made strides in final assembly and sub-assembly, particularly in the mobile and consumer electronics segments, it remains heavily reliant on imports for component manufacturing and design capabilities across all sectors. Segment wise position is given in the following paragraphs.

a. Mobile Phones

ii. **Final Assembly/ Sub-Assembly of Smartphone**: India's smartphone assembly sector has seen substantial growth, with around 2 billion units assembled between 2014 and 2022. This boom is driven by initiatives like 'Make in India' and the Production Linked Incentive (PLI) scheme. Sub-assembly of components such as battery packs and chargers has become largely localized, contributing to the sector's growth. However, other components like camera modules and displays have only achieved around 25% localization, indicating that while assembly capabilities are strong, significant dependencies on imported parts remain.

iii. **Component Manufacturing:** The production of mechanical and composite parts, such as casings and cables, is relatively advanced. Companies like Tata Electronics manufacture iPhone casings, achieving 10-15% localization of the Bill of Materials (BoM). Despite these advancements, a large proportion of high-tech components are still imported.

iv. **Design:** The design aspect for smartphones in India is minimal to non-existent. This lack of design capability means that while India is strong in assembly, it remains dependent on foreign technologies and designs, limiting its ability to innovate independently.

b. Consumer Electronics such as TV, Air conditioners, Refrigerators

iii. **Final Assembly/Sub-Assembly:** For TVs, India has a presence of multiple Electronics Manufacturing Services (EMS) companies like Dixon and Amber. These companies handle significant portions of the assembly, often in collaboration with OEMs such as Samsung. Displays, a major component, are still imported. In air conditioners and refrigerators, sub-assembly is done locally, but the overall assembly process is still dependent on largely imported components.

iv. **Component Manufacturing:** The TV segment relies heavily on imported open cells, constituting about 60% of the BoM. In contrast, air conditioners and refrigerators see more local production of through-hole components and electromechanical parts, demonstrating better localization in these segments.

v. **Design:** Design capabilities in consumer electronics are limited but growing. Companies like Dixon have made strides in the design of TVs. Meanwhile, home-grown OEMs such as Blue Star and Godrej Appliances have established some design and engineering capabilities, particularly for air conditioners and refrigerators. This progress indicates a slow but steady shift towards self-reliance in design.

c. IT Hardware such as Laptops, Servers

iv. **Final Assembly/Sub-Assembly:** The IT hardware sector in India is heavily import-dependent, with over 80% of laptops consumed domestically being imported. This reliance underscores a significant gap in local assembly capabilities for laptops and servers.

v. **Component Manufacturing:** The sector is primarily dependent on imports for its components, lacking substantial local manufacturing capabilities. This dependency highlights the need for developing local supply chains and manufacturing infrastructure.

vi. **Design:** Minimal presence in the design of IT hardware exists, with companies like VVDN Technologies and CDAC having limited capabilities. This lack of design expertise further compounds the sector's reliance on imports, indicating an area requiring focused intervention.

g. Telecom Products such as 4G/5G RAN, Baseband units, Antennas, and Others

i. **Final Assembly/Sub-Assembly:** The telecom equipment sector in India imports over 40% of its total requirements from China, indicating a significant dependency on foreign sources. This high import rate is primarily due to the lack of local manufacturing infrastructure for these complex products.

ii. **Component Manufacturing:** Component manufacturing for telecom equipment is also heavily reliant on imports. This dependency on foreign components highlights a strategic vulnerability, especially for critical infrastructure.

iii. **Design:** Efforts to enhance local design capabilities are ongoing, led by a consortium spearheaded by TCS. These initiatives aim to reduce dependency on foreign designs and foster innovation within India, positioning the country to better meet its telecom infrastructure needs independently.

e. Automotive components such as Powertrain, Body and Convenience, Connectivity

vi. **Final Assembly/Sub-Assembly:** The automotive electronics sector is about 65% import-dependent, particularly for sub-assemblies. This high import dependency indicates that while India has significant automotive manufacturing capabilities, electronic components are often sourced from abroad.

vii. **Component Manufacturing:** Low-tech components such as wire harnesses and connectors are manufactured domestically, covering about 10% of the Bill of Material (BoM). This local production supports the assembly process but does not address high-value, high-tech component needs.

viii. **Design:** Leading home-grown OEMs like Tata Motors and Mahindra & Mahindra (M&M) have established robust product design and engineering capabilities. However, their capabilities in electronic design are still limited. This partial gap in design expertise suggests a need for an enhanced focus on electronics within the automotive sector to reduce foreign dependency and increase innovation.

f. Wearables & Hearables such as Smartwatches, Headphones, Wristbands, Glasses, Rings, etc.

vii. **Final Assembly/Sub-Assembly:** The wearables and hearables segment is primarily focused on box assembly without significant Printed Circuit Board Assembly (PCBA) capabilities. Companies like Dixon manufacture for brands like boAt, but the high-value components are largely imported.

viii. **Component Manufacturing:** This segment is primarily import-dependent for its components, indicating minimal local manufacturing capabilities for critical parts.

ix. **Design:** There is minimal to no presence in design activities for wearables and hearables in India. This reliance on foreign designs limits the ability of local manufacturers to innovate and develop unique products independently.

2.2.4 Depth of India's strength across the value chain of the electronics sector is given in the following Exhibit:

Exhibit 9: Depth of India's presence across the value chain by Products

Depth of India's Presence:		High	Medium	Low
Segment	**Products**	**Final Assembly / Sub - Assembly**	**Component mfg.**	**Design**
Mobile 	Smartphones	• Assembly for mobile has taken off; ~2B cumulative shipments between 2014-2022 • Sub-assembly: Battery pack, Charger largely localized; Camera module, display assembly ~25% localization	• Production of mechanical and composites (casing, cable and box content etc.), • E.g., Tata electronics for iPhone casing (10-15% BoM)	• Minimal to no presence
Consumer electronics 	TV	• Multiple EMS (e.g., Dixon, Amber) / OEMs (e.g., Samsung) do finished product assembly / sub-assembly – Display is the largest component, sub-assembled in India for TV	• Open cells (~60% BoM) are primarily imported	• Limited design capabilities with players like Dixon
	Air conditioners		• Through-hole Components, Electro-mechanical components are manufactured	• Home-grown OEMs such as Blue Star, Godrej Appliances have established some design and engineering capabilities
	Refrigerator			
IT hardware 	Laptop	• >80% of laptops consumed domestically are imported	• Primarily import dependent	• Minimal presence (VVDN Technologies, CDAC)
	Server			
Telecom 	4G/5G RAN; Baseband unit (incl. CU, DU), Antenna / RRU, xPON FTTH, Others[1]	• >40% of total imports are from China	• Primarily import dependent	• Ongoing design efforts by a consortium led by TCS
Automotive 	Powertrain, Body and Convenience, Connectivity	• ~65% import dependent, i.e., most OEMs import sub-assemblies)	• Low tech components such as wire harness and connectors are manufactured (~10% BoM)	• Leading home-grown OEMs such as Tata Motors, M&M have established product design and engineering capabilities, but have limited capabilities in electronics
Hearables & Wearables 	Smart watch, headphone, wristband, glasses, ring, etc.	• Largely Box-assembly (No PCBA today) – e.g., Dixon for boAt,	• Primarily import dependent	• Minimal to no presence

2.2.5 To enhance self-reliance and global competitiveness, India needs to focus on increasing localization of high-tech components and developing robust design capabilities. Investments in R&D, supportive government policies, and partnerships with global technology leaders could drive further growth and reduce import dependency in the electronics sector.

2.3 Summary

2.3.1 India has made significant strides in electronics production, nearly doubling its output from ~US$ 48 billion in FY17 to ~US$ 101 billion in FY23. However, it has barely started to scratch the surface of its potential, given the global scale at US$ 4.3 trillion. India's growth has been primarily driven by the mobile phone segment, which now constitutes around 43% of the country's overall electronics production, indicating a need to expand into other segments, especially IT hardware, consumer, auto electronics, and telecom.

2.3.2 Within the mobile segment, Apple's significant expansion in India has been a primary driver of this growth, presenting an opportunity to attract other global brands to the Indian market. Much of the growth has been fueled by domestic demand, underscoring the need to pivot towards capturing global demand and increasing exports to maximize India's potential in the worldwide electronics market.

2.3.3 While there has been substantial growth in the assembly of electronic goods, the broader ecosystems for components manufacturing and design are still at nascent stages, highlighting India to move upstream in the value chain.


ABB
-F1.0
-F2.0
-F3.0
-F4.0
-F5.0
-F6.0
-K9.1
Frostschutz
KMA
Hand

Chapter 3

CURRENT CHALLENGES FOR INDIA IN SCALING PRODUCTION FOR THE WORLD

Chapter 3

CURRENT CHALLENGES FOR INDIA IN SCALING PRODUCTION FOR THE WORLD

3.1 As India strives to build a robust electronics manufacturing ecosystem, it faces significant challenges that affect its competitiveness as compared to leading electronics manufacturing nations like China and emerging hubs like Vietnam. Despite the benefits of government incentives, a considerable cost gap remains, which needs to be addressed for India to boost its participation in the electronics value chain. This chapter explores key obstacles that impede India's electronics manufacturing growth, such as high input costs due to tariffs, limited access to global markets, high capital costs, inadequate industrial infrastructure, a weak R&D and design ecosystem, the need for technology transfer, a shortage of skilled talent, and operational hurdles related to the Ease of Doing Business. Addressing these issues is crucial for India to emerge as a global electronics manufacturing hub.

3.2 Relatively high import tariffs:

3.2.1 The strategy of increasing duties to foster domestic manufacturing in India has proven to be effective for finished products but not as effective for building supply chains for sub-assemblies and components. This is because the supply

chain consisting of sub-assemblies and components requires production at a scale that cannot be achieved through domestic demand alone.

3.2.2 Indian manufacturers heavily rely on imported electronic components. In the absence of a domestic component ecosystem, Indian arms of global suppliers tend to set their prices at levels comparable to the cost of imported products with tariffs. This leads to higher costs for input parts, making them uncompetitive in global markets. Compared to Asian peers like China, Vietnam, Thailand and Malaysia, India maintains the highest tariff rates, with a simple average of Most Favoured Nation (MFN) tariffs for relevant lines around 7.5%, contrasting with China's ~4%, Malaysia's ~3.5%, and ~Mexico's 2.7%[11].

3.2.3 Moreover, India currently has one of the most complex tariff structures with multiple tariff slabs at 0%, 5%, 10%, 15%, and 20%+, along with a variety of surcharges, resulting in high tariffs on several sub-assemblies and components (unlike Vietnam and China). India's tariff structure, comprising multiple slabs, often leads to misinterpretations and disputes, increasing compliance costs. Moreover, the unpredictability and frequent tariff amendments further exacerbate the issue.

3.3 Lack of robust electronics component ecosystem:

3.3.1 While India's overall electronics production grew at a CAGR of ~13% between FY17 and FY23; electronics component production only grew at ~7%, reaching ~US$ 15 Billion in FY23 from ~US$ 8 billion in FY17[12]. A majority of the current ~US$ 15 billion component production is comprised of low-complexity components such as non-SMD (Surface Mounted Device) grade passives, electromechanical components, wound components, etc. An ecosystem for high-complexity components such as SMD grade passives, semiconductors, discrete actives, etc., does not currently exist.

3.3.2 Component manufacturing has not taken off despite the current incentive offered by the government through SPECS and PLI, as component manufacturing requires a higher upfront capex and has a lower turnover-to-investment ratio, which makes current thresholds unattractive. Also, there exists a gestation period of 1-2 years between investment and production in component manufacturing.

3.3.3 Indian component manufacturers also currently do not have access to the latest technologies and machines being used globally, and require knowledge and technology transfer from leading global component manufacturers for

[11] ICEA tariff Report
[12] MeitY Annual Report

complex components. Initial momentum seen with EMS players looking to integrate backward is currently limited to components used in mobile phone assembly. There is a need for reforms to help develop a robust electronics components ecosystem in India.

3.4 Lack of access to global demand:

3.4.1 India's domestic market currently stands at ~US$ 155 Billion, and though significant, it is not enough to fulfill India's electronics manufacturing ambitions. India must look to tap into global demand. In electronics, the top 5-7 lead brands in each category control ~80% of the worldwide market. These brands play a crucial role in helping countries establish their prominence in electronics manufacturing.

3.4.2 Samsung has significantly enhanced Vietnam's electronics production, contributing about 50% of its global output and exporting US$ 65 billion in 2022, which is 16% of Vietnam's total exports. Over 15 years, Samsung invested more than US$ 20 billion in Vietnam, focusing on manufacturing mobile phones, consumer electronics, and components. Through technology transfers and supplier support programs, Samsung involved around 210 local enterprises, leading to the integration of over 50 Tier-1 domestic suppliers and employing over 160,000 people.

3.4.3 Most of the above-mentioned leading brands (except Apple and Samsung) have not yet leveraged India for their global demand. For India to grow beyond its current capacity and tap into global demand, it must proactively attract one to two top brands from each segment to establish large-scale operations catering to both domestic and international markets.

3.5 High cost of capital:

3.5.1 Electronics manufacturing demands substantial upfront investments and working capital, presenting a significant hurdle due to India's relatively high cost of financing, which ranges from 9% to 13%. In contrast, countries like China, Vietnam, and Taiwan enjoy much lower interest rates of 2%-7% due to specific interest subsidies for the electronics sector. Although India has schemes to support MSMEs, the capital provided is often insufficient to meet the substantial financing needs of the electronics manufacturing industry.

3.6 Inadequate infrastructure facilities:

3.6.1 The government launched the Electronics Manufacturing Cluster (EMC) scheme in 2012 and the EMC 2.0 scheme in 2020 to aid the growth of the Indian electronics system design and manufacturing (ESDM) sector. However, the present Indian infrastructure lags behind its Asian counterparts. EMCs in their current state are not attractive for SMEs and large players to invest in. These clusters are expected to provide low-cost shared facilities such as tool rooms, warehouses, wastewater and effluent treatment plants, labour hostels, and so on. However, common facilities are absent for MSMEs to help reduce their cost of operations. In contrast, Vietnam's manufacturing clusters provide warehouses of different sizes with built-to-suit options and lab infrastructure for precision machines, semiconductors, etc.

3.6.2 Logistics and last-mile connectivity pose significant challenges, characterized by underdeveloped inner roads and delays at ports. While programs such as Gati Shakti have improved the road infrastructure by constructing expressways to reduce transport time to ports, prolonged customs processes result in high turnaround times, spanning 7-10 days (from factory to shore), rendering exports less competitive.

3.6.3 The high cost of land leases, especially closer to ports/ airports, also makes the upfront investment in building factories considerably steep, hindering the growth of manufacturing infrastructure.

3.7 Lack of R&D and design ecosystem:

3.7.1 India's expenditure on R&D remains significantly low, with investments constituting less than 1% of GDP. This is in stark contrast to the R&D expenditure by the USA and China, which exceeds 2.5% in the case of both. This highlights R&D as a critical gap, impacting India's ability to innovate and compete in the rapidly evolving electronics sector. Furthermore, a substantial portion of the Indian government's R&D investment is funneled into academic institutions. While academic research is vital, there is an urgent need to reallocate more funds towards industry. This shift would enable the development of commercially viable products and expedite the time to market.

3.8 Tech-Transfer Challenges:

3.8.1 Indian manufacturers currently lack the necessary technologies and skill-sets for advanced electronics and components manufacturing, making technology transfer a critical need. China is the leading supplier across most component groups, such as display, batteries, PCB, and Camera, with ~50% market share.

3.8.2 Press Note 3 which provides that an entity of a country sharing a land border with India or where the beneficial owner of an investment is an entity of such a country sharing border can invest only under the Government route further delays investments in joint ventures and their wholly owned subsidiaries with companies from land bordering countries are often delayed or rejected. This hampers the ability of Indian manufacturers to access technology for advances in the electronics sector. Additionally, there are delays in obtaining visas for foreign professionals needed for training and technology transfer processes, further impacting the development and adoption of advanced manufacturing capabilities.

3.9 Inadequate Talent and Skilling:

3.9.1 India faces a significant shortage of skilled engineers and a trained workforce necessary for electronics component manufacturing. This issue stems primarily from outdated training programs and curricula that do not align with current industry standards. Many institutes lack the necessary updates and specialized training to equip graduates with relevant and advanced skills required for the industry. Furthermore, there is a scarcity of specialized training institutes dedicated to electronics manufacturing, which exacerbates the problem.

3.9.2 As a result, companies in the sector incur substantial additional training costs for their employees. This often includes sending them to global training and manufacturing locations due to the unavailability of adequate facilities within the country. These additional costs are substantial and put a financial strain on companies, potentially deterring new entrants into the market.

3.9.3 Availability of quality fresh talent is low. One contributing factor is the negative perception of manufacturing jobs, which are often viewed as less prestigious or desirable compared to other fields. This perception dissuades many potential candidates from pursuing careers in electronics manufacturing. Moreover, the lack of hands-on experience, typically gained through internships, further limits the readiness of graduates for immediate employment in the sector. Without practical experience, new hires require more extensive training to become proficient, prolonging the time and resources companies must invest in their workforce.

3.9.4 The electronics component manufacturing sector in India faces significant skill gaps across various levels of the workforce, which hinder the industry's growth and efficiency. Analysis of manpower based on skills (Exhibit 10) highlights the need for comprehensive reforms in education, training infrastructure, and policy to better prepare India's workforce for the evolving demands of the electronics manufacturing industry.

3.9.5 At the entry level, operators are found to lack the specialized skills necessary for modern manufacturing processes. This deficiency can include both technical skills and familiarity with specific manufacturing techniques or equipment. The gap in specialized skills at the entry level is a fundamental issue as it affects the foundation of the workforce, making it challenging to maintain high standards of production and efficiency.

3.9.6 For mid-level roles such as technicians and supervisors, the skill gaps are more pronounced due to the outdated curricula and limited practical exposure provided by educational institutions. Many training programs have not been updated to keep pace with current industry practices, resulting in graduates who are not fully prepared for the technical demands of their roles. Furthermore, the inadequacy of lab infrastructure in training institutes exacerbates the problem. Technicians and supervisors often lack access to well-equipped labs where they can gain hands-on experience with modern equipment and techniques, which is crucial for their professional development and effectiveness in their roles.

3.9.7 At the high level, including engineers and managers, there is a notable shortage of skilled talent. This segment of the workforce requires advanced technical knowledge and leadership skills to drive innovation and efficiency in electronics manufacturing. Current educational and training systems do not sufficiently equip engineers and managers with the necessary expertise. This shortage of skilled high-level professionals significantly impacts the industry's ability to innovate and compete on a global scale.

3.9.8 The general workforce in the electronics manufacturing sector also faces issues of low labour productivity. This can be attributed to inadequate training, outdated practices, and insufficient investment in workforce development. Another critical challenge is the delay in the timely approval of visas for skilled foreign professionals. These delays hinder the ability of companies to bring in essential expertise and facilitate knowledge transfer to the local workforce, thereby slowing down progress and innovation.

3.9.9 In addition to these specific skill gaps, there are broader issues related to workforce readiness and awareness. Many new entrants into the workforce are not adequately prepared for the demands of the electronics manufacturing industry. This readiness gap includes a lack of technical skills and a poor understanding of industry standards and practices. Enhancing overall awareness about career opportunities and requirements in the electronics manufacturing sector is also crucial. By improving awareness, more talent can be attracted to the industry, and prospective employees can be better informed about the skills and knowledge needed to succeed. The current profile of the workforce in the electronics sector along with skill gaps is given in the following Exhibit:

Exhibit 10: Talent and skilling challenges in Electronics Manufacturing

Skill Level	Key Roles	Skill Gaps
Design engineers & Researchers: Highly **specialized skills** involving research and design **(~5%)**	R&D, design engineer and lead	**Lack of specialized skills:** Key gaps include **inadequate understanding of latest technologies**, weak theoretical concepts, **insufficient practical training**, **deficient testing** skills
Technicians and supervisors: Skills requiring **technical** training inputs & knowledge of complex operations and supervisory skills **(~75%)**	Process Operator / Technicians & Engineers, Line Supervisors, Supply Chain Specialist	**Outdated Curriculum with limited Practical Exposure:** 80% of Indian electronics engineers don't possess reqd. skills[1]; **650x0+ teaching positions vacant in 40+ Universities** due to budget constraints, **low quality of applicants** & remote location of Universities[2]; Global players often unable to find Indian institutes to train workers
		Inadequate Lab Infrastructure: AICTE closed 400+ colleges in 2014-18 due to **poor infrastructure & low attend[3].** Limited access to high quality training facilities, **lack of suitable equipment** in higher education, training institutes hampers development
		Lack of Skilled Talent: Lack of **talent needed for high precision mfg**. Key skill gaps include poor **defect identification, lack of machine handling** and learning initiative, and inadequate computer, data management, and quality skills. For supervisors, gaps are **inadequate preparation and supervision** of inspection manuals.
Technicians and supervisors: Skills requiring **technical** training inputs & knowledge of complex operations and supervisory skills **(~75%)**	Process Operator / Technicians & Engineers, Line Supervisors, Supply Chain Specialist	**Low labor productivity:** Need to boost mfg. productivity through **targeted skilling, reskilling, upskilling programs and interventions**
		Delay in Timely approval of Visa: Challenges faced in timely issue of business visas for specialists, engineers and technical professionals for tech transfer & training of local talent
Associates / Support roles: Skills acquired with a modular and focused intervention; employability with minimal education **(~20%)**	Quality & Material Handling/ Logistics Specialist, Helper	**Workforce readiness challenges:** Often **lack industrial culture**, requiring short behavioral training. Key skill gaps include **high absenteeism, lack of discipline**, and **inability to identify & report material deviations.**
		Enhance overall awareness: Insufficient awareness of health and safety standards, despite being educated about the same

Source: Project Analysis, NSDC, ESSCI

3.10 Challenges in 'Ease-of-doing Business':

3.10.1 As per the World Bank's Ease of Doing Business Report 2020, India was ranked 63rd on the Ease of Doing Business Index, a significant measure of how conducive a country's regulatory environment is to the start and operation of local firms. This ranking reflects India's ongoing efforts to streamline regulations, reduce bureaucratic red tape, and enhance the overall business climate. Although India has made significant improvements in its ease-of-doing-business environment, however, it still ranks at the bottom when compared to competing nations, i.e., the top 10 electronics manufacturing countries (China, USA, Germany, Taiwan, Japan, South Korea, Malaysia, Mexico and Vietnam).

3.10.2 Frequent policy changes add to the burden on businesses operating in India. Changes in tax laws and import tariffs disrupt supply chains and strategic planning for companies engaged in international trade. Additionally, there are frequent delays in the disbursement of state government incentives, which result in working capital issues for companies, further straining their financial resources and operational capabilities.

3.11 Fiscal disabilities for manufacturing in India:

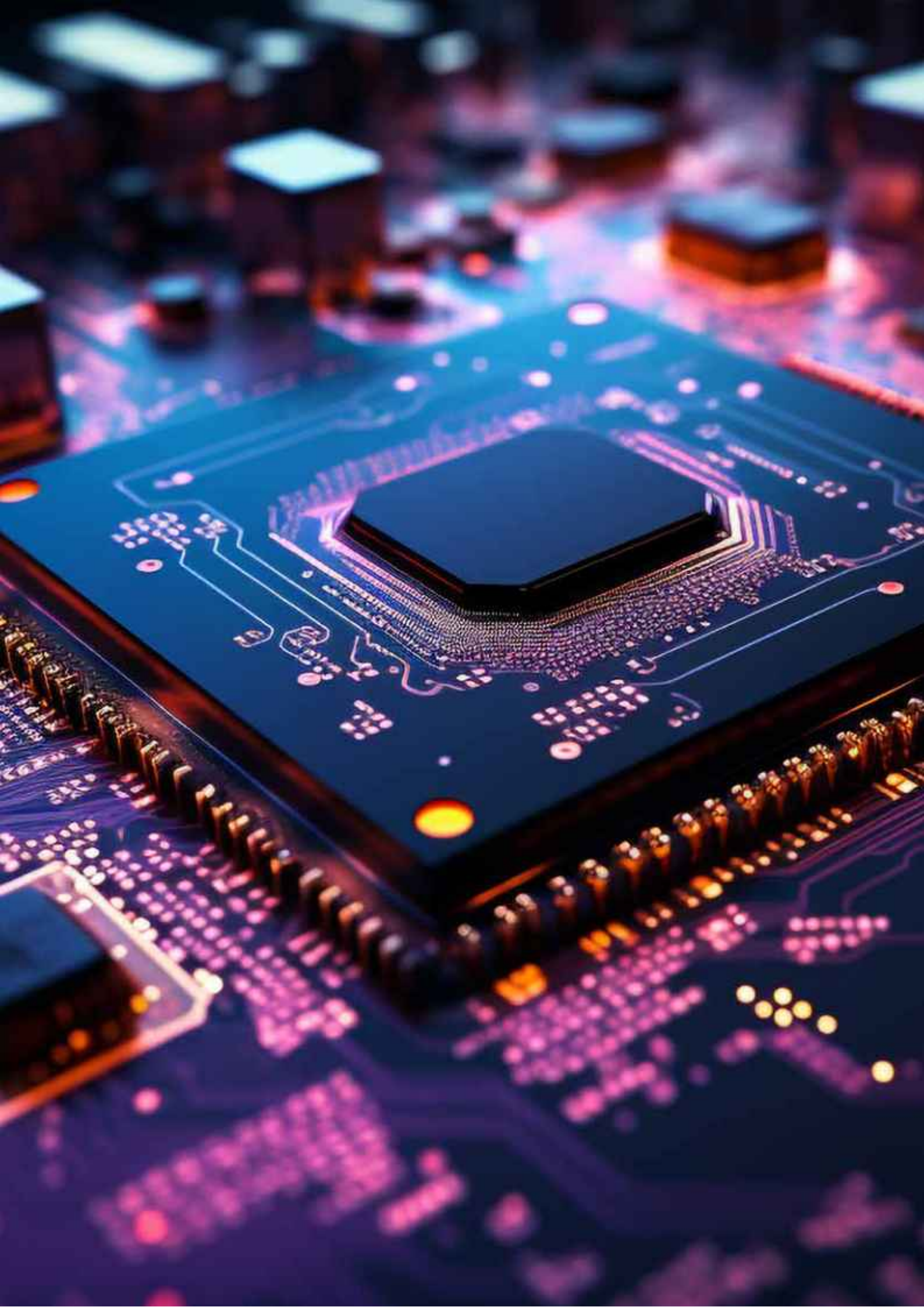
3.11.1 India's electronics manufacturing faces a cumulative cost disability of 10%-14% for assembly and 14%-18% for components manufacturing due to several factors. Tariffs and material costs result in a 5%-6% disadvantage for assembly and 4%-5% for components compared to China due to the high cost of inputs. China has a clear advantage due to the local presence of components and sub-assembly ecosystems. Logistics issues contribute an additional 2%-3% cost, while high finance costs add 1%-2.5% for assembly and up to 4% for components.

3.11.2 Although India has a 1.5% advantage in conversion costs due to lower labour and utilities expenses, the benefit is partly offset by lower productivity (higher attrition, fewer working hours, lower skills) and higher oversight costs (3 shifts instead of 2 shifts in China). Further, higher lending rates in India lead to a 1%-2.5% cost disability in assembly and up to -4% disability in component manufacturing. Capex subsidies in India are lower than China's, resulting in a 2% disability for assembly and 3%-4% for components. Other preferential policies in China, such as tax benefits and R&D incentives, further disadvantage India by 1%-2% in assembly and 2%-3% in component manufacturing. Details on account of cost disability are given in the following Exhibit:

Exhibit 11: Cost Disability in the Electronics Sector

3.12 Conclusion

3.12.1 To address the aforementioned challenges, it is crucial to examine the policy initiatives of countries that have successfully dominated the value chain. By analyzing these strategies and building on its inherent strengths, India can develop policies tailored to its unique context, thereby enhancing the sector's appeal to investors.



Chapter 4

GLOBAL BENCHMARKING

Chapter 4

CURRENT CHALLENGES FOR INDIA IN SCALING PRODUCTION FOR THE WORLD

4.1 POLICY INITIATIVES BY ASIAN COUNTRIES

4.1.1 Asian countries like China, Vietnam, Malaysia, and Taiwan are key players in electronics manufacturing, propelled by strategic initiatives and robust policies. China, with ~US$885 billion in electronic exports, leads the market[13]. At the same time, smaller nations like Vietnam and Malaysia, with GDPs near US$450 billion[14], one-eighth of India's GDP, have solidified their positions in electronics value chains through favorable government policies. As India aims to strengthen its position and leapfrog in the electronic component landscape, learning from the experiences of these global peers is essential.

4.1.2 The governments of the above-mentioned Asian countries have taken several key initiatives to stimulate electronics manufacturing spanning across seven dimensions: Trade and export promotion policies, taxation, financial regulations, hard infrastructure support, soft infrastructure support, R&D and tech ecosystem, and lead investors.

[13] S&P Global, UN COMTRADE

[14] Wikipedia, Viet data

[15] Trade Policies & Exports Promotion, Taxation, Financial Incentives, Hard-infra support, Soft-infra support, R&D and Techecosystem, Key Investors

4.1.3 While all these competing nations have emphasized support across seven key dimensions[15], Vietnam, in particular, has emphasized reforms in taxation (5 to 10 years tax breaks, 50% Corporate Income Tax), trade and export policies (duty-free imports of capital goods, input components, FTAs (with major demand and importing centers), Business enablement (doing away with value-add requirements, flexible labor laws, and on). Similarly, Malaysia provides 10-15 years of tax exemption for new manufacturers, along with incentives for capital expenditure offset against income, fostering electronic manufacturing growth.

4.1.4 Taiwan provides substantial financial support to chipmakers, offering low-interest loans. China and Vietnam also offer interest rate subsidies and low-cost loans to electronics companies, ensuring accessible credit. China leads in infrastructure development, offering the world one of the largest and most efficient clusters, reducing the cost of operations. Lately, China has been offering financial support for chip manufacturing, launching a National Integrated Circuit Industry Investment fund.

4.1.5 The role of private companies, particularly anchor players like Samsung and Intel in Vietnam and the "eight samurais" in Malaysia, is crucial in driving success through substantial investments. These companies contribute significantly to the development and growth of robust electronics manufacturing ecosystems in their respective countries.

4.1.6 A comparison of global benchmarking across seven key dimensions including trade/exports promotion, taxation, financial regulation, hard infra support, soft infra support, R&D/Technology ecosystem and key investors across four countries i.e., Vietnam, Malaysia, China and Taiwan are summarized as under:

i. **Trade/exports promotion:** The promotion of trade/exports has been done by providing various incentives/ benefits by the above mentioned four countries as under:
   - **Vietnam** has low tariff rates with duty free import. It has signed aggressive FTAs with major demand centers such as the UK, EU, ASEAN, and others, in order to promote exports.
   - **Malaysia** provides tax incentive of 20% on increased export value which can be offset against total income for 5 years. There is also an Eemm.com portal to promote local Electrical & Electronics (E&E) companies globally.
   - **China** has special trade arrangements in Special Economic Zones (SEZs) and Free Trade Zones (FTZs), allowing duty-free imports, Besides, it also provides VAT rebates of up to 115% of VAT paid inputs on goods exported
   - **Taiwan** has 10 Export Processing Zones with long-term (-10 years) leases. Further, the rent is capped at 5% of the land value and there is 0% VAT, customs duty.

ii. **Taxation:** Various incentives in the form of reduced rate of taxation have been provided by these four countries as under:
   - **Vietnam** has lower corporate tax rate of 10% (vs. standard 20%) for up to 10 years. It also has 2-4 years of tax holiday with a further 50% reduction on tax payable for 4-9 years. There is a 5-year import tax holiday for materials used in IPs & EPZs.
   - **Malaysia** provides a 10–15-year tax exemption for new manufacturing companies. It also has 5-year tax incentive under which 60% of capex offset is available against 70% income. It also provided up to 100% tax exemption for 10 years for companies which are involved in R&D.
   - **China** has lower corporate tax rate of 15%. It also provides tax exemption of up to 10 years for integrated circuit manufacturers. Further, there is a tariff exemption on imported semiconductor parts till 2030.
   - **Taiwan** provides tax credits for chip makers which includes up to 25% sof R&D expenses. There is a tax deduction of 5% of the cost of procuring advanced machinery for chip makers.

iii. **Financial Regulation:** With respect to the financial regulations, these countries provide easy access to credit with reduced interest rates as under:
   - **Vietnam** provides an interest rate subsidy of 3% for medium/ long term loans. It also provides low-cost loans – at 1.2% p.a. for SMEs, -4%

p.a. for high-tech industries vs. ~10% standard rate. Further, the short term lend-rate is capped at 7% p.a. for hi-tech companies.

- **Malaysia's** Business Growth Fund (BGF) offers grant-equity funding for new companies (~RM150M).
- **China** offers a lower lending rate of 2-4.3%. There is a 30% growth in credit flow to electronics, computer, and auto industries. Further, the government provides for the risk guarantees.
- **Taiwan** provided ~US$800M credit at net interest rate of ~0.5% to SMEs – for post COVID business turnaround.

iv. **Hard-infrastructure support:** With respect to the hard-infrastructure support including land leasing, roads, transportation etc., these countries have undertaken various initiatives as under:

- **Vietnam** provides land on a long-term lease (50-70 years) and has lowering capex requirement. There is a provision of 50-100% land lease reduction for new facilities in high-tech clusters. It provides for 3-years 100% land rental exemption in socio-economically challenged areas. It also has policy to promote local component ecosystem for the high-tech industry.
- **Malaysia** has Special Economic Regions with duty, tax, and other exemptions. There is an Industry4WRD Fund to support upgradation projects at SMEs with ~50% of capex subsidy. Further, up to 200% capital support is provided for manufacturing using automated equipment for 36+ months.
- **China** has set up a National Integrated Circuit Industry Investment Fund which was launched in 2014 (~US$150 billion target). It also provides financial support of up to 60% of project cost. It has launched Made in China 2025 initiative with a target of ~70% localization of manufacturing.
- **Taiwan** has been developing tech clusters such as Hsinchu Science Park wherein there is 0% VAT and corporate tax is capped at 17% with uninterrupted water/electricity. The Government provides contribution of up to 49% of capex in a new project. It has also earmarked ~US$100 million in 2020 and ~US$160 million in 2021 for fabs.

v. **Soft infrastructure support:** With respect to the soft infrastructure support including manpower/skilling etc., these countries have undertaken various initiatives as under:

- **Vietnam** has vocational training programs and also provides reimbursement for private training initiatives. Further, the private sector also is taking efforts to build a talent pipeline (e.g., Intel's partnership with Arizona State University).

- **Malaysia** provides for flat 15% income tax for foreign C-suite executives in approved companies. Besides, there is a Structured Industry Apprenticeship Program (SIAP) for integrated circuit design and development.
- **China** provides various tax incentives, patent subsidies, and faster residence permits for overseas skilled workers. It has abundant skilled engineering talent with low management oversight required. There are also university partnerships for advanced manufacturing talent requirement.
- **Taiwan** has academic-industria cooperation and scholarships to promote talent development. It also has 'Recruitment and Employment of Foreign Professionals' act in place to retain foreign talent.

vi. **R&D/Technology ecosystem:** The R&D ecosystem is crucial for fostering innovation and driving technological advancement. With respect to promoting R&D ecosystem, these countries have undertaken various initiatives as under:

- **Vietnam** has created a Dedicated National Technology Fund. Further, it has provisions to place 10% of profits in a tax-deductible fund for R&D projects.
- **Malaysia** provides for deduction of up to 200% of non-capital in-house R&D expenditures or payments to non-related contract R&D companies. It also has partnership with MIMOS[16] and CREST[17] to grow R&D, develop IP, and adopt latest tech in E&E.
- **China** provides funding support to state-level engineering technology research centers, labs. It also provides subsidy up to 50% in R&D costs for electronics manufacturing. Further, 200% R&D expense is available as deduction for electronics, given that IP stays in China.
- **Taiwan** has R&D center & grants (<US$0.7M per project) in key industries where <50% expenses are provided from govt. Further, the government funds <40% of the investment on semi-fabs or R&D.

vii. **Key investors:** The key investors in the electronic component manufacturing landscape across these four countries are as under:

- In **Vietnam**, Samsung has driven ecosystem growth and has invested more than US$20 billion over last 15 years. Further, Schindler, Jabil, Microsoft entered in the country in -2015.
- In **Malaysia**, Clarion, Osram, AMD, Renesas, Texas Inst., Intel, Agilent, Bosch referred to as the 8 samurais, were the first to set up manufacturing capabilities in Malaysia in the 1970s.

[16] MIMOS is Malaysia's national applied R&D center under Ministry of Science focused on electrical & electronic industry.

[17] CREST (Collaborative Research in Engineering, Science & Technology) is an agency of MITI to grow Research, Development & Commercialization ecosystem for E&E through collaborative research between academia & industry.

- In **China**, the ecosystem is driven by home-grown companies like Huawei, BOE, and Foxconn, among others.
- In **Taiwan**, TSMC drove primary growth supported by UMC and MediaTek. Their capabilities include wafer foundry, IC design, PC, optoelectronics, precision machinery & materials.

Case Study of Vietnam

- Vietnam has emerged as one of the fastest-growing electronics manufacturers and exporters since 2008, with exports surging to approximately $135 billion in 2023 from around $3 billion in 2008. The Vietnamese government employed several strategies to achieve this growth, including signing Free Trade Agreements (FTAs) with major electronics trading economies, attracting significant Foreign Direct Investment (FDI) through incentives, and maintaining an export-oriented approach.

Vietnam's Electronics Industry Growth: Three Phases

Phase 1 (Pre-2010): Foundation for Growth

- FTAs and Trade Facilitation: Vietnam signed FTAs with key partners such as the US, China, and India to enhance trade.
- Industrial Parks: Development of industrial parks like Dong Nai Hi-Tech Park and Hoa Lac Hi-Tech Park.
- Anchor Investments: Major investments from global players; Intel announced a $1 billion facility in 2006, and Samsung announced a $670 million investment in 2008.

Phase 2 (2010-2017): Rapid Growth in Production and Exports

- Global Manufacturers: Attracted substantial investment from global electronics manufacturers.
- Samsung's Expansion: Samsung invested heavily, approximately $20 billion over 14 years.
- Other Key Players: Companies like Panasonic, Sony, and Canon established manufacturing and assembly plants.
- Foxconn's Role: Foxconn set up factories to manufacture electronic components such as PCBs and connectors.

Phase 3 (Post-2017): Steady Growth and Diversification

- Continued Expansion: Samsung, LG, and Foxconn expanded their operations.
- • Significant Contribution: By 2023, Samsung accounted for about one-third of Vietnam's total electronics exports.
- • Diversification: Emphasis on manufacturing a broader range of electronics beyond mobile phones. Apple started mass production of AirPods in Vietnam in 2020 and plans to begin producing Apple Watch and MacBook.

- • R&D Centers and 5G: Establishment of R&D centers and positioning as a hub for 5G-related devices.
- The phased development approach has positioned Vietnam as a major player in the global electronics manufacturing landscape

Samsung's Role in Strengthening Vietnam's Electronics Ecosystem
Role of Samsung in fortifying Electronic Ecosystem in Vietnam

2009

With an initial investment of ~$670 million, Samsung started operations in Bac Ninh province.

2012

Established Mobile Research and Development Center in Hanoi, focusing on developing software for mobile phones and other electronic devices.

2014

Localisation of supply chains with involvement of domestic firms. With initial investment of ~2Billion dollars, established factory (SEVT) for mobile components.

2016

Samsung expanded its research and development efforts in Vietnam ,opening the Samsung Electronics HCMC CE Complex (SEHC) in Ho Chi Minh City.

2017

With investment of ~$1.2 Billion , established electro-mechanics plant to manufacture electronic components.

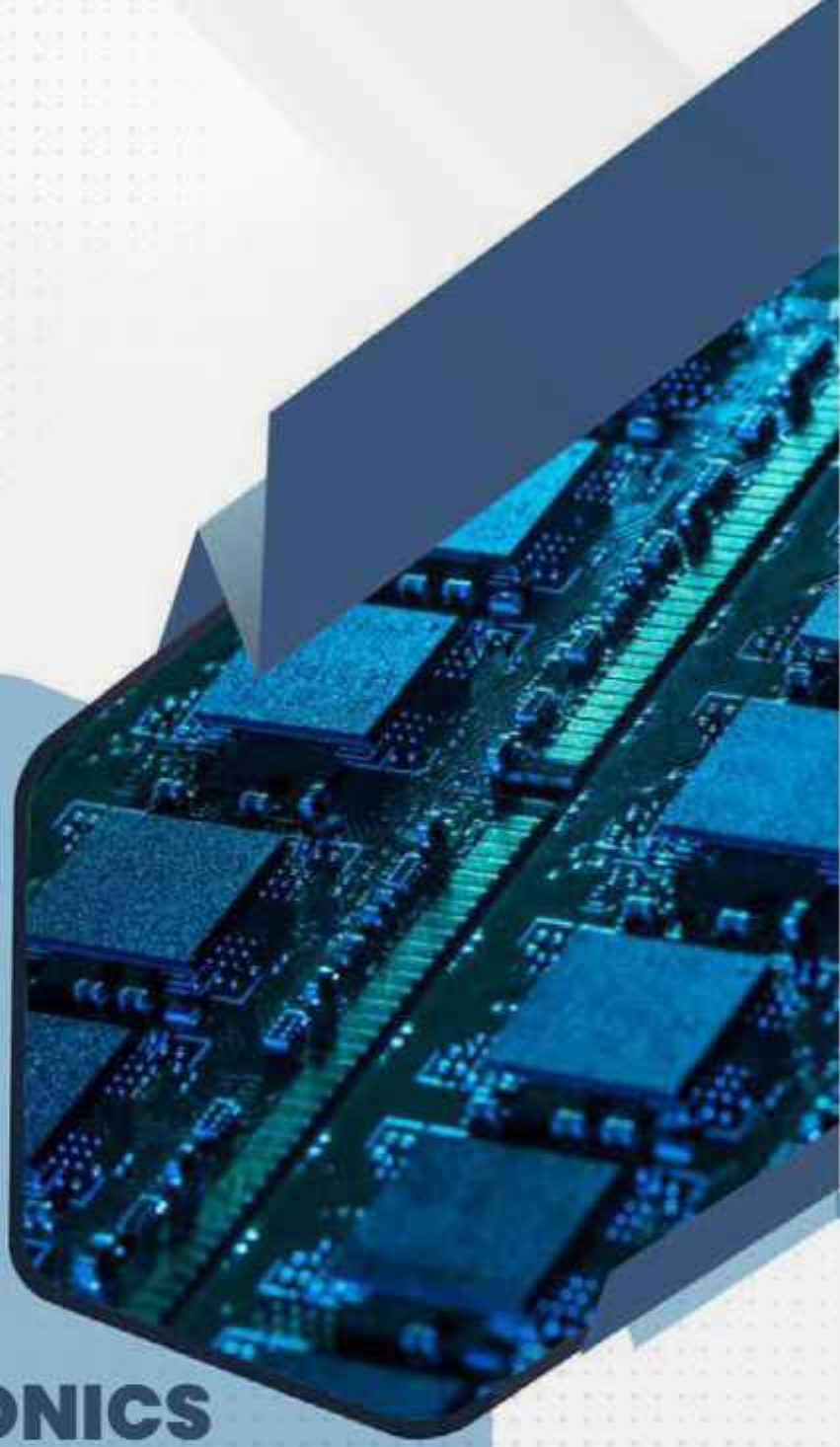
2019

Samsung R&D Center in Hanoi, worth US$220-million inaugurated, becoming the biggest research facility in Southeast Asia.

2022

Thrust on skilling with Samsung & MOIT completed training course for around 200 Vietnamese consultants, 42 local Vietnamese Tier-1 suppliers


CE
RoHS
12V



Chapter 5

INDIA'S ELECTRONICS VISION for FY30

Chapter 5
INDIA'S ELECTRONICS VISION for FY30

5.1 Importance of Electronics Sector

5.1.1 With an anticipated growth rate of nearly 8% in the coming years, India is poised to become the third largest economy globally by 2028-29. This impressive growth trajectory is underpinned by the country's ambitious plans to establish itself as a global manufacturing hub for high-value items. By focusing on advanced manufacturing sectors, India aims to further propel its economic growth and enhance its global competitiveness.

5.1.2 Electronics manufacturing and integration into global electronics value chains will be pivotal in enhancing India's manufacturing capabilities. This sector's significance extends beyond its direct contributions to GDP and employment. Electronics manufacturing encompasses multiple domains, including consumer electronics, telecommunications, automotive, healthcare, and defense. The advancements in this sector can lead to the development of a robust industrial ecosystem, fostering innovation and collaboration across various fields. Moreover, a strong electronics manufacturing base is essential for achieving self-reliance in critical technologies and reducing dependence on imports.

As India continues to invest in infrastructure, skill development, and policy reforms, the electronics manufacturing sector is expected to be a cornerstone of its economic strategy, driving sustainable growth and development in the years to come.

5.1.3 In FY23, India's domestic electronics production has surpassed US$101 billion, growing at an impressive rate of nearly ~13% annually. The expanding electronics production in India, coupled with substantial global and domestic market opportunities, provides a robust platform for the country to pursue its long-term vision with heightened ambition. To realize this vision, it is essential to support it with appropriate policies and strategic interventions. India's achievements thus far highlight the momentum gained and underscore the need to shift focus toward more comprehensive segments, including components and design.

5.2 Production Scenarios @ 2030

5.2.1 Scenario 1: Electronics manufacturing is growing at a CAGR of 13%. If it continues growing at a similar pace which is Business As Usual (BAU), by 2030, the overall electronics production is expected to reach US$278 billion, with finished goods production at US$253 billion and components production US$25 billion. Most of the production is expected to be consumed domestically. Additionally, the country may face challenges in being competitive in exports, both for components and finished goods.

5.2.2 Scenario 2: As highlighted in the previous paragraph, the BAU approach will only reach US$278 by FY30. However, with policy reforms and focus on select components, there is a potential to achieve US$500 billion in electronics productions growing at a CAGR of ~ 25%, with ~US$350 billion in production being contributed by finished goods and ~US$150 billion by components. To achieve this, it is essential to focus on scaling up select segments to drive exports, such as mobiles, wearables, and IT hardware. Additionally, it is crucial to scale up the manufacturing and export of specific component groups. This strategy will also help achieve 70-80% local production of electronics for domestic consumption across all major segments.

5.2.3 Scenario 3: With a broad-based sectoral growth approach having dual focus on scaling exports and bossing domestic consumption, there is a potential to achieve US$625 billion in electronics productions growing at a CAGR of ~ 30%. Achieving this would also require broad-based scaling across all major segments, including telecom, strategic defense, industrial and components. A summary of these three scenarios is given in Exhibit- 12:

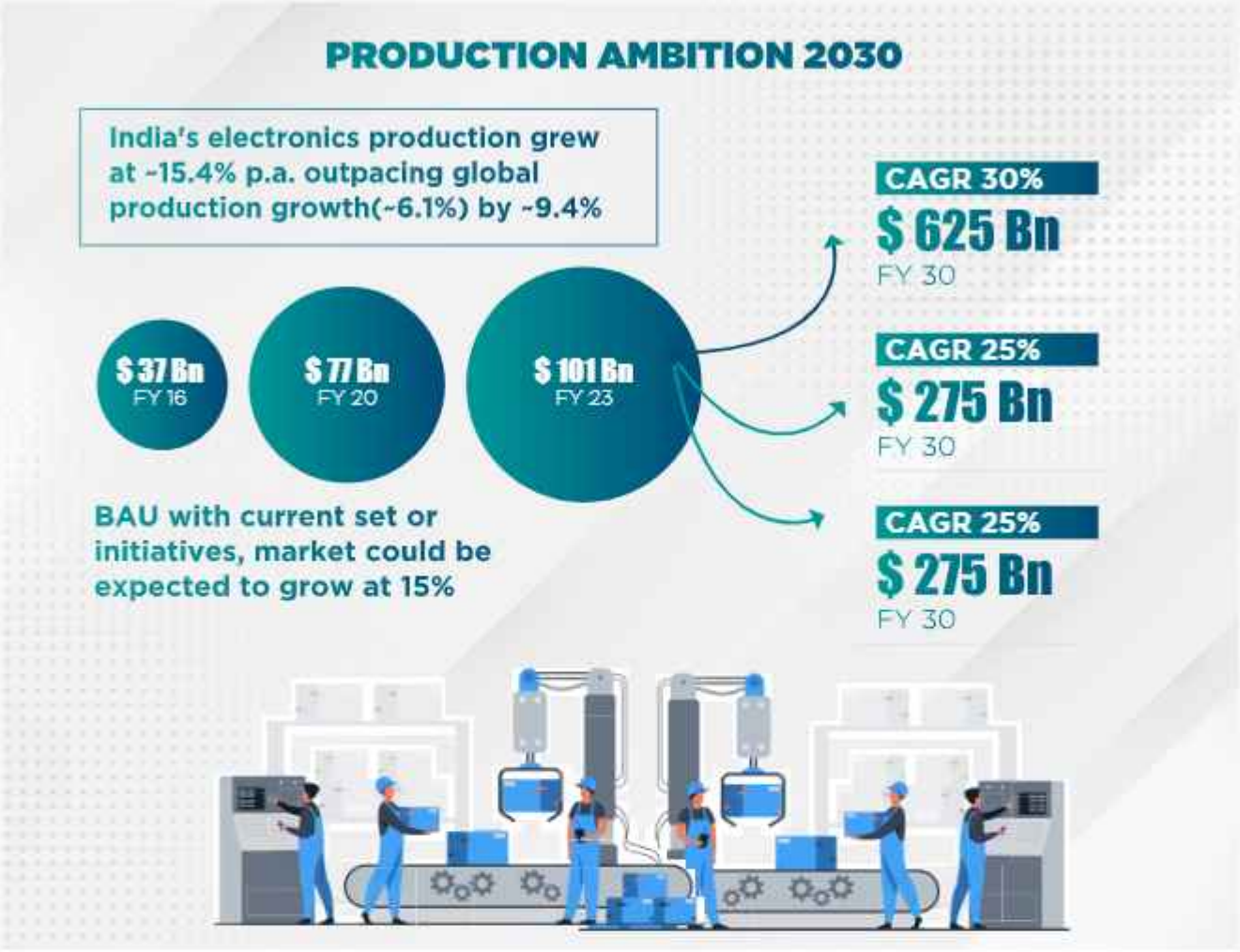
Exhibit 12: Summary of production scenarios @ 2030

Source: Project Analysis

5.3 Vision @ 2030

5.3.1 Considering the three different scenarios, Scenario 2 is deemed the best option for setting the Vision for 2030. This approach allows for focused scaling up of select components and categories of segments, enabling a more efficient allocation of resources. By concentrating efforts on specific segments and components, we can optimize growth and achieve the desired outcomes more effectively.

Exhibit 13: India Electronics Vision FY30



Source: Project

Exhibit 14: Recommended Ambition 2030

Point of Departure		Point of Arrival	
FY 23	Parameter	BAU Growth (FY 30)	With policy support/ incentive (FY 30)
66	Finished Goods Production ($ Bn)	253	350
15	Components Production ($ Bn)	25	150
101	Overall Electronics Production ($ Bn)	278	500
1.1-1.3	Job Creation (Mn)	2.2-3.4	5.5-6
15-16	Value Addition (%)		>35

Overall Electronics ($Bn)

Parameter	Production	Export	Import	Net Foreign Exchange	Domestic Consumption
FY23	101	24	78	-54	155
BAU FY30	278	111	252	-141	419
With policy support/incentive FY30	500	240	213	28	473

5.3.2 With targeted approach and appropriate interventions, India could aim to achieve US$500 billion in electronics production. Further, both finished goods and components are expected to play key roles, with finished goods contributing approximately US$350 billion to production and components contributing around US$150 billion. This strategy would not only help India become a net exporter (with exports surpassing imports) but also increase Domestic Value Addition (DVA) to over 35%, up from the current 15-18%. By aiming for US$500 billion in production, India could target a 4-5% share in the global electronics exports by 2030.

5.3.3 Targeting US$500 billion in electronic production will not only aim for significant economic output but also generate substantial employment opportunities, thereby significantly boosting the sector's workforce. Total direct employment in the electronics manufacturing sector is expected to reach between 5.5 and 6 million by 2030. This growth will be driven by the increased demand for skilled labor to support expanded production capacities and the development of new manufacturing facilities. Additionally, the emphasis on scaling up select segments and components will create a range of job opportunities across various skill levels, from high-tech engineering and design roles to manufacturing and assembly positions. The resulting employment boom will not only enhance individual livelihoods but also contribute to broader economic development and stability within the country.

5.4 Achieving US$350 Billion Production in Finished Goods

5.4.1 With an aim to achieve US$500 billion in electronic production, ~US$350 billion would be contributed by finished goods. India's strategy for electronics assembly of finished goods can unfold along three concurrent paths.

(i) **Achieve global scale in established segments:** Expanding assembly operations to meet the growing demand in both the domestic market and international markets, focusing on product segments such as mobile devices and consumer electronics.

(ii) **Diversify into new product segments:** There is a need to venture into other scaled plays where India has had limited success thus far, such as laptops and telecom HW. Also, there is a need to tap into new dynamic areas, such as hearables, wearables, and IoT devices.

(iii) **Expanding Operations:** Expand operations beyond mere assembly to include sub-assemblies such as camera modules and display components. This shift will allow us to move up the value chain in electronics manufacturing, fostering deeper integration into global supply chains.

5.4.2 Product Segment: Electronics encompasses a wide array of product segments including mobile phones, consumer electronics, industrial equipment, and strategic electronics for defense, IT hardware, automotive electronics, MedTech, and more. While identifying target segments, the emphasis has been on prioritizing the largest and fastest-growing sectors to optimize strategic targeting efforts. Mobile phones, IT hardware, consumer electronics, hearable/wearable, auto, and telecom electronics are the priority segments:

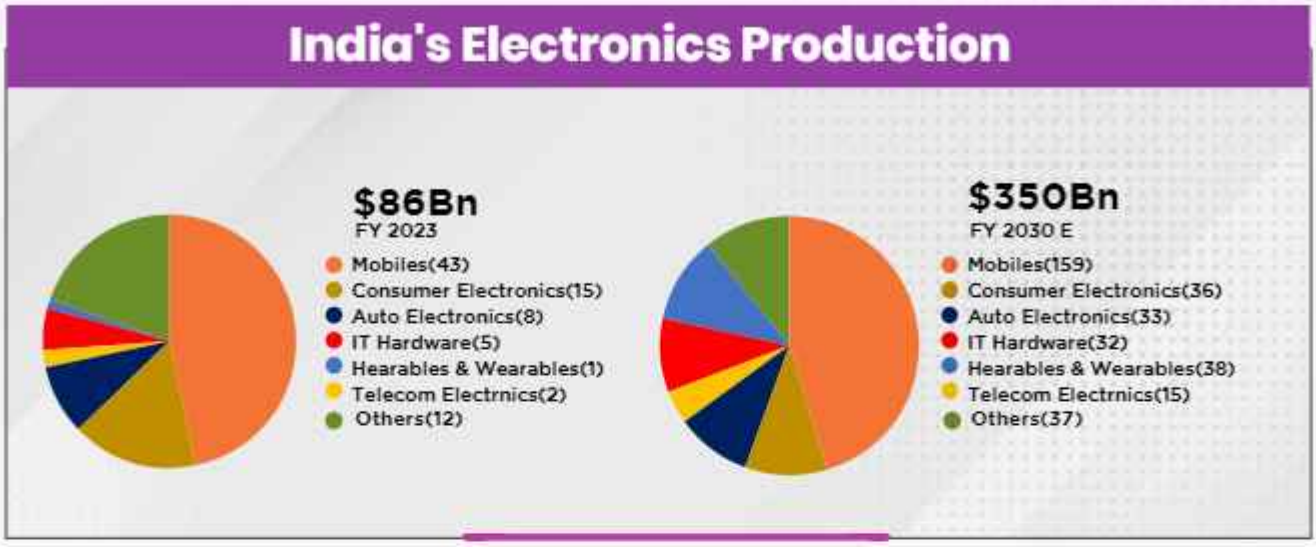
5.4.2.1 It is important to focus on mobiles, IT hardware, and consumer electronics, as they are the largest mass-market segments with a huge potential to grow. India has experienced significant momentum in mobile phone production in recent years and should strategically intensify its focus on this sector. Given the country's success and potential in mobile manufacturing, doubling down on this industry presents a promising opportunity to bolster economic growth, enhance technological capabilities, and capitalize on global demand. By leveraging existing infrastructure, skilled workforce, and favorable policies, India can further strengthen its position as a key player in the global mobile phone market

5.4.2.2 Hearables and wearables represent an emerging category in the electronics industry with evolving supply chains that have yet to reach full maturity. This presents India with a distinct opportunity to establish a strong foothold in these markets. India can aim to strategically position itself as a key player in the global landscape of hearables and wearables.

5.4.2.3 Auto electronics is poised for significant growth, particularly fueled by the increasing adoption of electric vehicles (EVs). This sector is anticipated to expand rapidly as automotive manufacturers globally are shifting towards electrification to meet stringent environmental regulations and consumer demand for sustainable transportation solutions. India, with its growing market and emphasis on electric mobility, stands to benefit from this trend.

5.4.2.4 India has built indigenous 5G capabilities and can now aim to scale up production and exports quickly. Prioritizing these segments will enable India to tap into critical global demand centers. Details on account of India's finished goods Electronics production are given in Exhibit-15.

Exhibit 15: India Finished Goods Electronics production for FY30



Source: Project Analysis, S&P Global, IDC, Gartner

5.5 Achieving US$150 billion in Component Production

5.5.1 Value Chain Focus: India's emphasis till now has predominantly been on establishing assembly capacity. However, to bolster global competitiveness, the next phase of growth should also prioritize value chain localization (component manufacturing) in identified segments, alongside assembly scale-up, to strengthen manufacturing capabilities.

5.5.2 Component Manufacturing: Presently, electronic components constitute ~10% of India's electronic exports, as compared to 30-50%[18] for China & Vietnam. With targeted approach and appropriate interventions, Component manufacturing is targeted to reach ~US$150 billion in production by FY30 from the existing US$15 billion. This would also help in increasing domestic value-add and job creation. The electronic components ecosystem can be divided into three broad categories:

5.5.2.1 Category A: This includes active SMT grade components (semiconductors) for which global players own IP, and a high initial capex is required to start production (e.g., microprocessors, power electronics for EVs, memory and storage chips, etc.). The government has announced a separate ~US$10 billion scheme—The India Semiconductor Mission—focused on these components. The scheme has attracted interest from some of the global players, such as Micron, Foxconn, and Tower Semiconductor. On the back of this momentum, India can expect to produce ~US$20 billion worth of category A components by 2030.

[18] Euromonitor

5.5.2.2 **Category B:** This includes components that are currently not produced in India, require some level of tech transfer for production, and have moderate to high capex requirements. (e.g., SMT-grade passives such as ceramic capacitors and actives such as transistors, diodes, high-complexity sensors, battery cells, etc). Though these components are covered under the Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS) and Production-Linked Incentive (PLI)s, domestic production has yet to take off. The focus should be on targeting 3-4 specific components (e.g., Display, SMT-grade passives) for scale and enabling access to technology in those targeted areas. Category B components are expected to contribute US$55-60 billion in production by 2030.

5.5.2.3 **Category C:** This includes components that are presently manufactured in India, though at a limited scale, by a few players. Broadly, category C includes elements that are low in complexity and have relatively low initial capex requirements (e.g., PCBs up to 8 layers, low-tech sensors, connectors, casings, wire harnesses, etc.) and do not require tech transfer. Key players producing these components are AT&S, Shogini, Epitome, Ascent, Deki, Vishay, etc. These players need to be enabled to manufacture at scale and become globally cost-competitive. Given that it is relatively easy to scale production for these components, Category C could contribute the highest share of additional output estimated at US$70-75 billion, to help India achieve its target production by 2030.

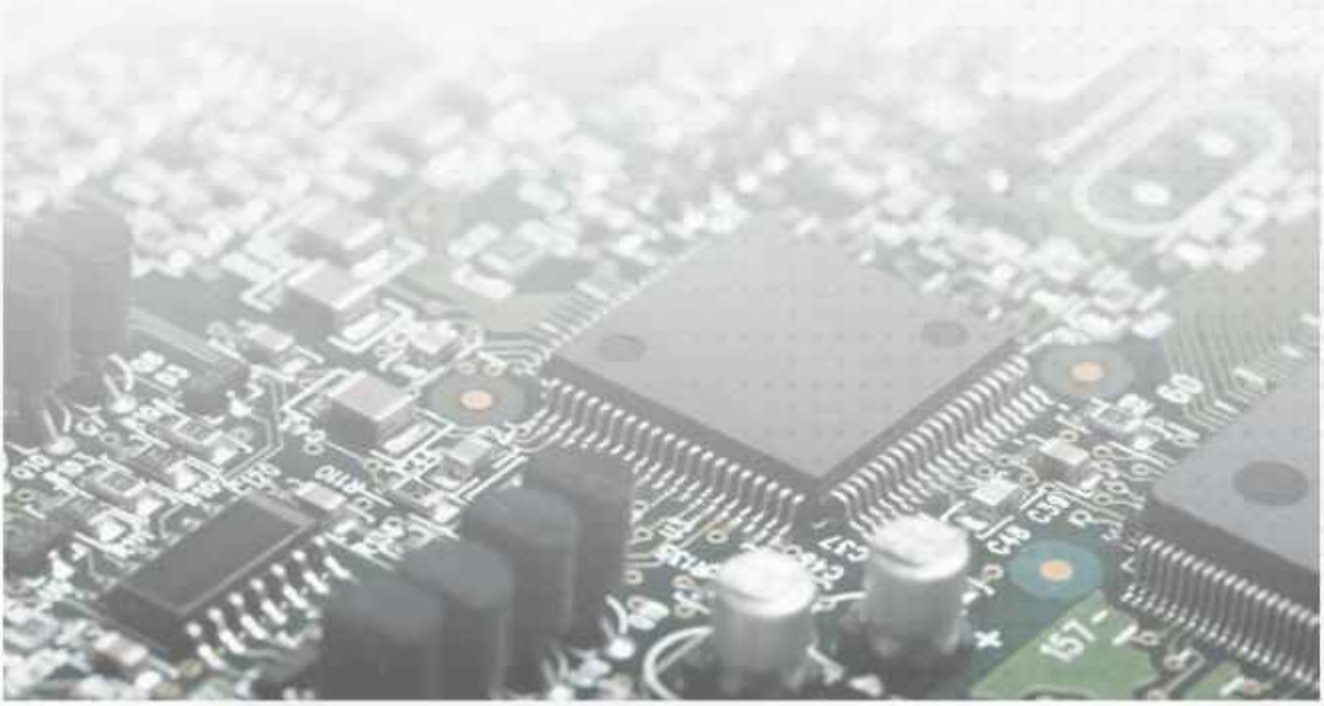


Exhibit 16: Electronics Component Ecosystem by category and target breakup

India prod. FY30

COMPONENT CATEGORY A	~13%	~20
Semiconductors		~20
Microprocessor (Logic)		
Memory (DRAM)		
Storage (HDD/SDD)		
MOSFET/JFET		
Power electronics EVs (e.g., thyristor etc.)		
RF Power (5G)		

COMPONENT CATEGORY B	~39%	55-60
SMD Grade (incl. actives)		31-33
Multi-layered PCBs *(8+ layers), and* **Precision components** *(SMD grade passives and other IC Chips, e.g., power mgmt. chip, etc.)*		21-23
Other components (complex sensors, transistors, diodes)		~10

Display	10-12
Touch panel components (e.g., open cells, color filters, etc.)	
Other display components (e.g., gate driver ICs, source driver ICs, front facing cameras & sensors, etc.)	
Other components	14-15
Camera components (Lens, Actuators, Sensors, etc.)	
Battery cells	

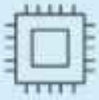
COMPONENT CATEGORY C	~48%	70-75
Non-SMD grade, other components		70-75
Low tech Passives		11-12
PCB (<8 layers)		11-12
Electromechanical components (e.g., connector, switch, sensors, actuators)		38-40
Other components (e.g., wire harness, cables, battery circuits, keypads, USB, other components		10-11

Source: Project Analysis

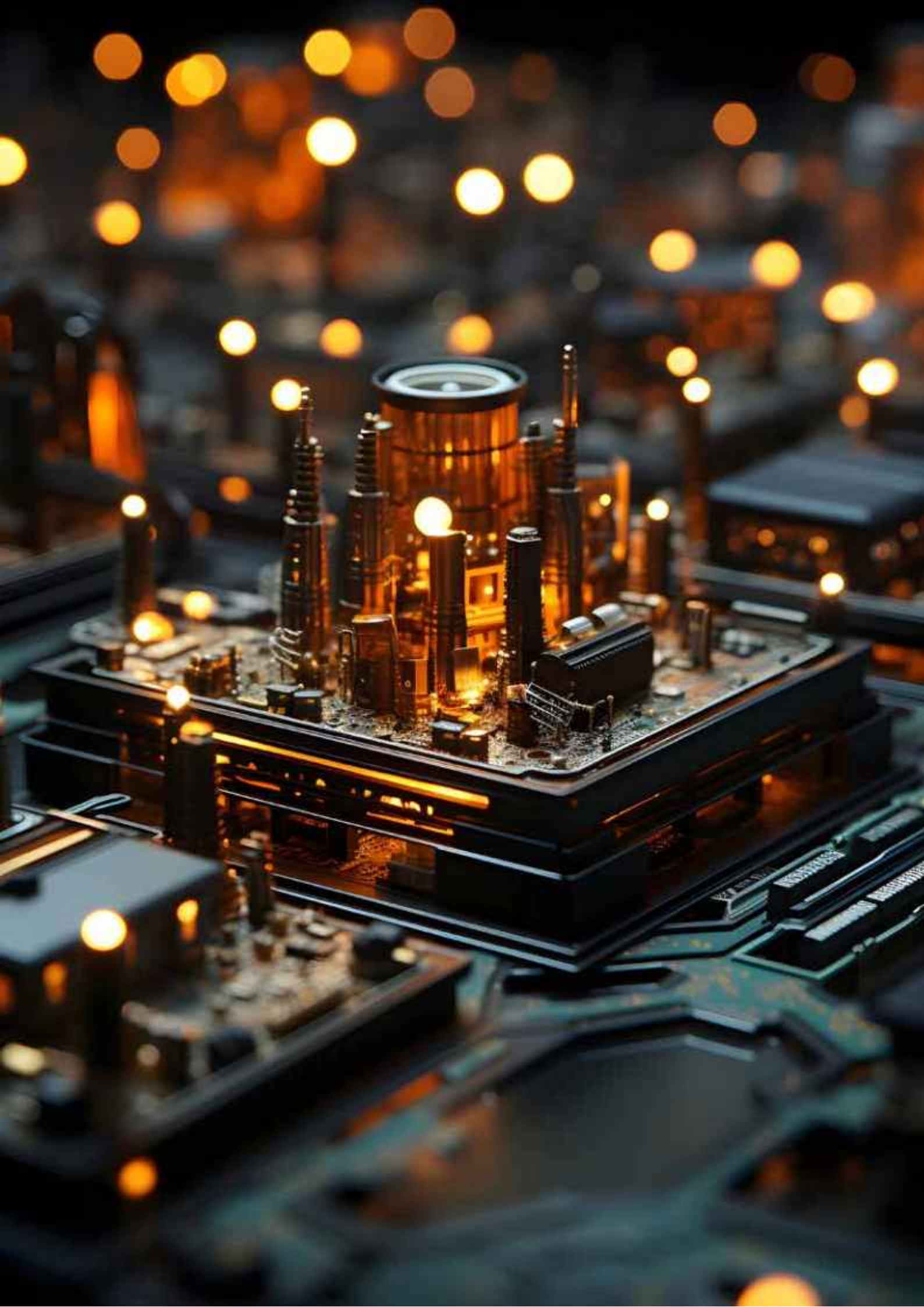
5.5.3 A pertinent question that arises is how to identify critical components for strategic investment. One effective starting point is to analyze the share of components in the Product Bill of Materials (BoM). For instance, a detailed breakdown of the BoM components in mobile phones, as shown in Table 2, provides valuable insights into where India should strategically focus its efforts.

5.5.4 Parallelly, development of a localized design ecosystem is critical for the local sourcing of components, as new designs also offer the opportunity to try newer parts.

Table 2: BoM split for Mobiles.

KEY COMPONENTS	BOM%	CURRENT LANDSCAPE	OUTLOOK
PCB 	7%	Indian players can **manufacture up to 4-layer PCBs**, however, most phones **require 8+ layer PCBs** for which dependent on imports	Import dependence to continue, **will require tech transfer** in high-end equipment to mfg. high-quality PCBs (multi-layer, HDI, flex PCBs)
Display ***(glass, touch controller, display)*** 	15%	Foreign players (e.g., Samsung, CSOT) started manufacturing **LCD displays;** premium smartphones use **hi-tech OLED / AMOLED**	Samsung sub-assembling mobile displays in India; Vedanta – Twin Star – Innolux (TOT) to start mfg. displays; Optiemus & Corning partnership for glass mfg.
Processor, memory 	25%	100% imported as **no fabs / ATMP**[2] in India today	Global players TSMC, MediaTek lead the market; **4 projects approved (**Tata electronics – PSMC, Tata electronics for ATMP, Micron and Renesas)
Passives 	18%	SMT-grade passives for Smartphones are largely imported, small presence of global players (e.g., TDK, Wurth)	As local assembly achieves scale, companies could be expected to **backward integrate** and and manufacture these
Camera Module 	12%	**Camera assembly** with few players operating at **limited scale**; high dependence on **imports for components** (lens, sensor, etc.)	Apple-Sunny Opotech, Syska-Biometric-Suyin partnerships, Holitech, Qtech engaged in camera module assembly in India; OEM-ODM-EMS partnerships to drive manufacturing of components in coming years
Battery Module 	6%	**Battery cells** are mostly **imported** from China/Korea; some domestic players engaged in battery assembly	**CATL in talks to expand in India; Excide entered in agreement with SVOLT energy;** Cells expected to be produced in India in 3-5 years
Mechanical, Composites & others[1] 	17%	**High localization** (>80%[3]) in **Charger, USB Cable, Gift box Medium localization** (~20%[3]) in **Die Cut Parts, Mechanics ~100% imports**[3] **for Vibration Motor, Mic and Receiver**	**Salcomp (charger) & Luxshare (cables)** to expand in India; Jabil & Tata Electronics to manufacturing casing

Source: Expert interviews, ICEA, Project Analysis



Chapter 6

POLICY INITIATIVES AND REFORMS TO HELP INDIA ACHIEVE ITS AMBITION

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POLICY INITIATIVES AND REFORMS TO HELP INDIA ACHIEVE ITS AMBITION

6.1 To achieve India's vision of reaching US$500 billion in electronics production and US$200-225 billion in exports, both finished goods and components are expected to play crucial roles. It is anticipated that finished goods will contribute approximately US$350 billion to production, while components will account for around US$150 billion. This goal could be achieved through a targeted approach and appropriate interventions, including providing incentives, implementing trade and export promotion policies, enacting taxation reforms, and offering both hard and soft infrastructure support. Additionally, fostering a robust R&D and technology ecosystem will be crucial for developing the entire ecosystem.

6.2 The policy initiatives and reforms have been broadly categorized into two major heads:

i. Fiscal interventions for components manufacturing, R&D and industrial infrastructure; and

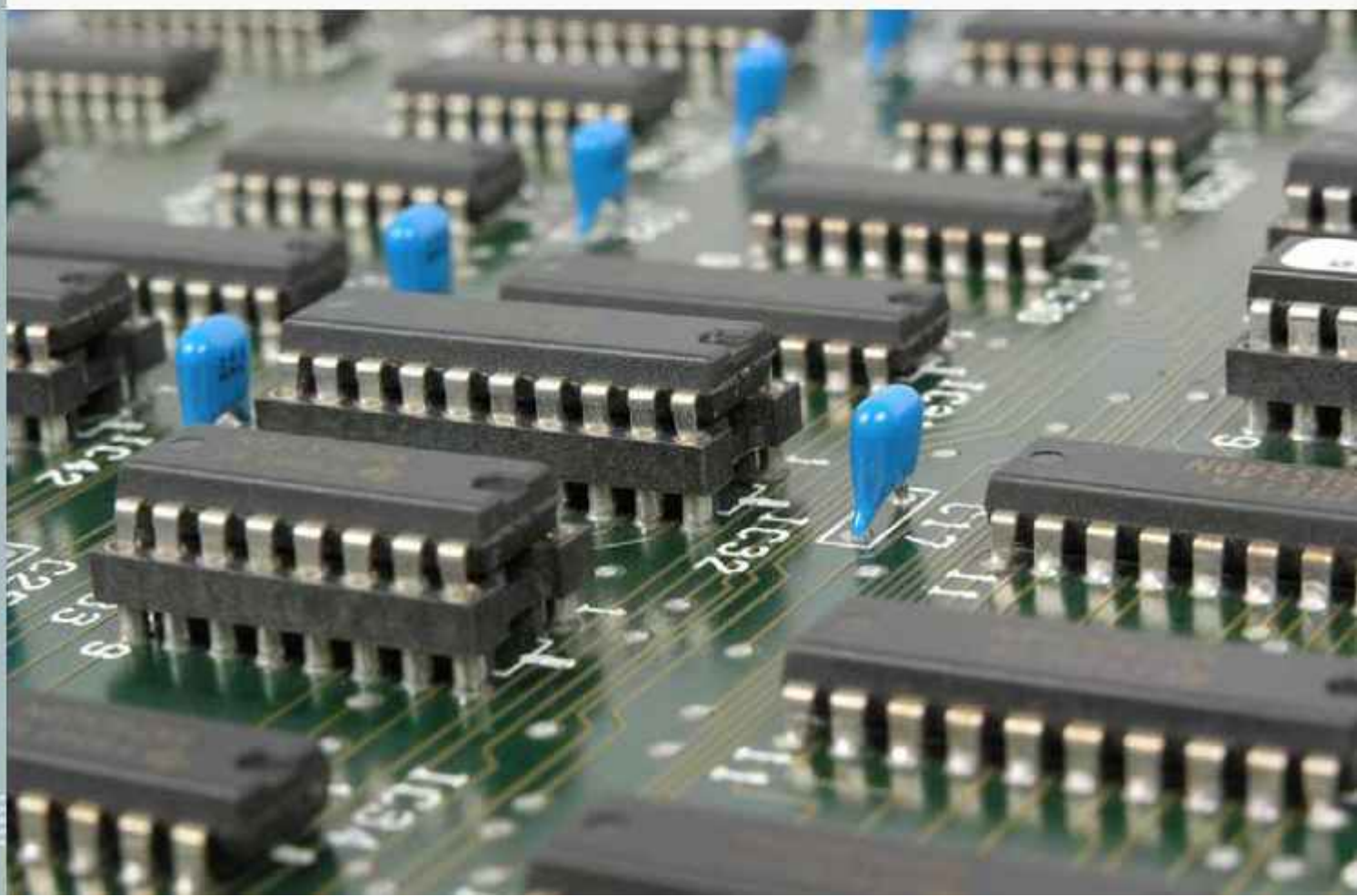
ii. Non-fiscal interventions for overall electronics manufacturing.

6.3 FISCAL INTERVENTIONS:

6.3.1 **Fiscal incentives for component manufacturing:**

a. Although current government schemes offer incentives for most electronic components, industry participation remains limited due to several factors. Present scheme structures fail to address the unique economic realities of component manufacturing. Unlike assembly operations, which benefit from a higher capital-to-output ratio (ranging from 1:8 to 1:16), component manufacturing operates on a much lower capital-to-output ratio of 1:1 to 1:3. This means that the same amount of capital invested in component manufacturing yields significantly less output when compared to the assembly operations.

b. Additionally, component manufacturing faces a higher cost disability, ranging from 14-18%, in contrast to the 10-14% for assembly operations. Cost disability encompasses various factors such as operational expenses, labour costs, and material inefficiencies that are disproportionately higher in component manufacturing. These economic challenges make it difficult for component manufacturers to remain competitive and profitable under the current incentive structures. This disparity underscores the need for a dedicated incentive scheme tailored specifically for component manufacturing. Such a scheme should consider the unique financial dynamics and operational challenges of component manufacturers, providing targeted support to bridge the economic gap.



c. Keeping in the mind the above aspects, there is a need to provide fiscal incentives for component manufacturing. Such fiscal incentives may be categorized under three categories:

i. **Opex support** for scaling manufacturing of components which are less complex and have relatively low capex requirement. These are being produced locally though at a small scale. This category of components is non-SMT grade, electro-mechanicals, low tech passives, etc.

ii. **Capex support** to help set up support manufacturing for specific complex components (e.g., mechanics, Li-ion cells etc.). Such parts/components would finally feed into the SMT/non-SMT grade components.

iii. **Hybrid support** (capex + opex) to help set up manufacturing of components which are highly complex and have very high capex requirement. These are not produced in India and include high-complexity components e.g., SMD grade, 8 layers+ PCB, passives etc.

6.3.2 **Fiscal incentives for Product/System Design Ecosystem:**

a. Apart from providing incentives to the component manufacturers, there is a need to promote a robust product and system design ecosystem. This can be achieved by incentivizing product innovation to cultivate Indian champions and scaling up the production of components and products that are 'designed in India'. Under this category, the incentives may be provided under two categories:

i. **Product Innovation Scheme** to promote incubation of product innovation and research and development across product categories that develops into globally competitive Indian champions over the next 4-5 years.

ii. **Scale-up Scheme** to provide incentive to promote scale for electronics 'designed in India'. This would help scale up design-focused Indian companies across various product and component categories, enabling them to develop into globally competitive Indian champions over the next 4-5 years.

6.3.3 **Fiscal incentives for scaling up the Industrial Infrastructure:**

a. Industrial infrastructure for electronic component manufacturing is crucial for industrialization as it ensures smooth supply chain operations, attracting both domestic and foreign investors by providing a reliable foundation for business operations. It not only supports advanced technologies, fostering innovation and competitiveness, but also generates employment opportunities, boosting the local economy and living standards.

b. The government launched the Electronics Manufacturing Cluster (EMC) scheme in 2012 and the EMC 2.0 scheme in 2020 to aid the growth of the Indian ESDM sector. However, the present Indian infrastructure lags behind its asian counterparts. EMC clusters in current shape are not

attractive for SMEs and large players to invest in these clusters. There is a lack of common facilities, tool rooms, warehouses, wastewater and effluent treatment plants, labour hostels, and so on. Therefore, there is a need to provide fiscal incentive for scaling up the Industrial infrastructure.

c. There is also a need to undertake a thorough audit of existing EMC clusters to evaluate utilization, implementation problems, and the state of facilities provided.

The essential suggestions are listed below:

i. Development large-size scaled clusters; preferably 4 greenfield clusters and 6 brownfield clusters,
ii. Provision for localized regulations (e.g., labor laws) and cluster governance
iii. Provision for essential common facilities– waste treatment plans, industry grade utilities and connectivity (around airports),
iv. Improvement of overall attractiveness of clusters through duty free imports (Free Trade Zones) and
v. Provision for worker's housing

6.4 Non-fiscal interventions for overall electronics manufacturing:

6.4.1 Tariffs simplification and rationalization of Taxes

a. High tariffs on components are hindering India's ability to scale up electronics exports and compete globally.
   i. The current tariff structure, with rates ranging from 0 to over 20%, significantly inflates the cost of inputs for Indian electronics manufacturers compared to other emerging economies.
   ii. On average, India's tariffs on relevant electronics are around 7.5%, which is higher than China (4%), Malaysia (3.5%), and Mexico (2.7%).
   iii. These high tariffs put Indian electronics exports at a 5-6% cost disadvantage, making them less competitive in the global market.

   Therefore, there is a need for simplifying and streamlining the tariff structure so as to unlock India's export potential in the electronics sector.

b. Additionally, to bring down production costs and compete effectively with neighboring economies, India needs to rationalize its tax structure (both Direct and Indirect) for the electronics sector.

6.4.2 Soft Infrastructure/ Skilling:

a. India's ambition of becoming a major electronics producer faces a significant hurdle: a lack of skilled workers. Educational institutions have not kept pace with the industry's rapid evolution. Outdated training programs and curricula fail to equip graduates with the advanced skills and knowledge needed for electronics component manufacturing. This

is compounded by a scarcity of specialized training institutes dedicated solely to this field. Many institutes simply lack the resources to update their programs and provide the hands-on experience crucial for success in this sector.

b. Increasing awareness about the exciting career opportunities and educational pathways in electronics manufacturing becomes critical. Highlighting the diverse roles and competitive salaries can attract a wider pool of talent to the sector. Additionally, having a multi-pronged strategy to enhance the skilling in the country is vital for the overall development of the manufacturing ecosystem. This could be done by adopting the following approach:
   i. By attracting overseas high-level talent for high precision manufacturing and design with attractive incentives;
   ii. By expedited visa approvals for professional visiting for training/ business purposes;
   iii. By fostering collaboration between academia and industry for advanced manufacturing and high-tech skills (mid-level courses);
   iv. By improving readiness through ESDM-relevant vocational courses at school level;
   v. By supporting industry for skilling workers and setting-up Electronics Skill Training Hubs.

6.4.3 **Technology Transfer & Business Enablement:**

a. A major hurdle for Indian electronics manufacturers is the lack of in-house expertise for complex, high-precision components like those made using Surface Mount Technology (SMT). This dependence on foreign players for technology and knowledge transfer, often through joint ventures (JVs), can limit long-term growth. To empower domestic electronics manufacturing, a convenient and economically viable technology transfer process is essential. Additionally, there is a need to develop a mechanism to fast-track approvals under Press Note 3 (2020) for specific proposals where foreign companies are critical for ecosystem development.

b. To foster a thriving electronics manufacturing sector, the government should prioritize streamlining regulations, lowering compliance costs, and simplifying the process for starting and operating manufacturing facilities thereby enhancing the Ease of Doing Business in India.

A summary of the fiscal and non-fiscal interventions is as under:

Fiscal Interventions

1. Fiscal incentives for Components manufacturing

- Opex support for scaling manufacturing of low complexity / locally produced components (non-SMT grade, casing, glass, etc.)
- Capex support for high-complexity components (Mechanics, capital goods, special components (SMD grade), Lithium-Ion cells)
- Hybrid support for high-complexity components (SMD grade, 8 layer+ PCB, passives etc.)

2. Product/System Design ecosystem

- Innovation scheme: To promote SMEs/R&D centers of Indian firms to invest in product design and R&D
- Scale up scheme: Incentive to promote scale for electronics 'designed in India'

3. Scale up Industrial Infra

- Develop large-size scaled clusters,
- Provision for localized regulations (e.g., labor laws) and cluster governance
- Each cluster to provision essential common facilities- waste treatment plans, industry grade utilities and connectivity (around airports)
- Improve the overall attractiveness of clusters through duty free imports (Free Trade Zones)
- Worker's housing facilities

Non- Fiscal Interventions

4. Tariffs simplification and rationalization of Taxes

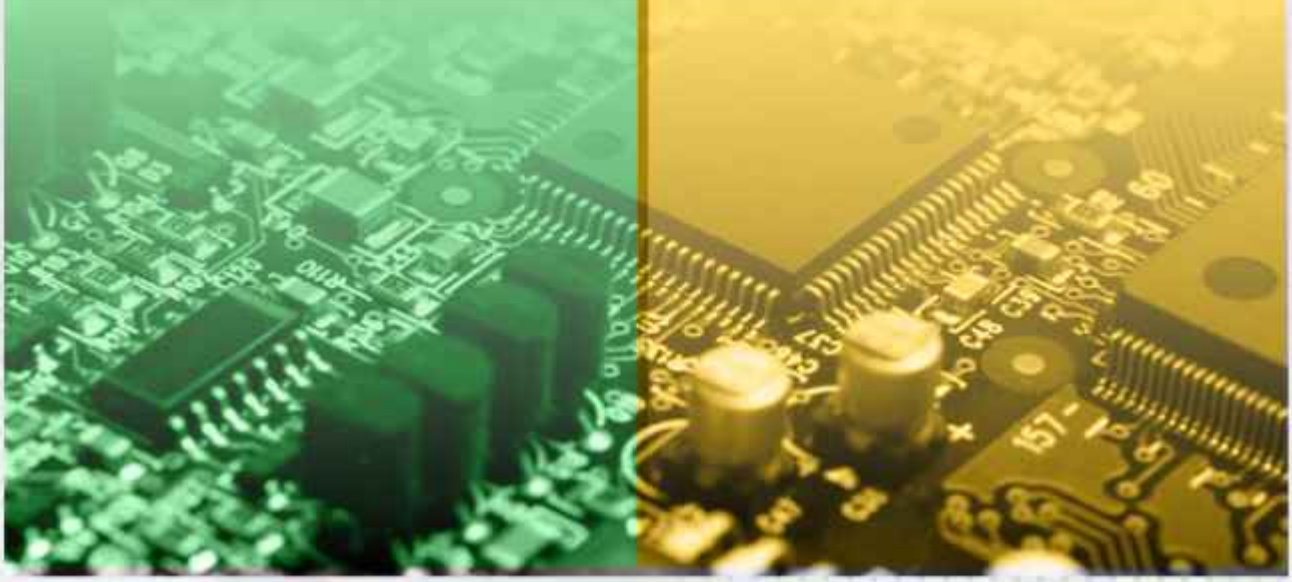
- Rationalize tariffs / duties on inputs to improve competitiveness of Finished Goods for exports
- GST and Income tax rationalisation

5. Soft infrastructure/Skilling

- Attract overseas high-level talent for high precision mfg. and design with top position and attractive pays
- Expedited visa approvals for training
- Foster collaboration b/w acad. & industry for advanced mfg. and high-tech skills (mid level courses)
- Supporting Industries for skilling and setting up Electronics skills training hubs

6. Tech Transfer and Business enablement (EoDB)

- Simplify the process of Tech Transfer and fast-track approvals (PN3) required for components manufacturing
- Rationalize permits for on-ground operations required across all levels of govt.
- Lowering compliance costs and streamlining regulations



REFERENCES

- https://www.oecd.org/trade/topics/global-value-chains-and-trade/#:~:text=In%20reality%2C%20about%2070%25%20of,consumers%20all%20over%20the%20world.
- https://www.statista.com/statistics/264682/worldwide-export-volume-in-the-trade-since-1950/#:~:text=In%202022%2C%20the%20global%20trade,trillion%20U.S.%20dollars%20in%202000.
- https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=CN
- https://www.macrotrends.net/countries/CHN/china/exports
- https://icea.org.in/blog/wp-content/uploads/2022/06/Draft-Press-Release-Vision-Document-2.0-18012022.edited.pdf
- https://www.investindia.gov.in/sector/electronic-systems
- https://www.ey.com/en_in/advanced-manufacturing/why-india-s-electronics-manufacturing-services-sector-is-growing#:~:text=Domestic%20production%20has%20nearly%20doubled,electronics%20manufacturing%20services%20(EMS).
- https://www.livemint.com/news/india/indias-electronics-exports-end-31-month-growth-streak-11697649800844.html
- https://economictimes.indiatimes.com/industry/cons-products/electronics/india-becomes-2nd-largest-mobile-manufacturing-nation-counterpoint/articleshow/102715599.cms?from=mdr
- https://www.statista.com/statistics/757415/india-electronics-fdi-inflow/
- https://blog.mygov.in/editorial/india-become-the-second-largest-mobile-manufacturer-in-the-world/
- https://timesofindia.indiatimes.com/blogs/unheard-echoes-of-young-mind-2/how-did-india-become-the-second-largest-mobile-manufacturer-in-the-world/
- https://indbiz.gov.in/mobile-phone-exports-from-india-almost-double-by-august-23/
- https://www.business-standard.com/companies/news/india-to-tap-12-of-global-iphone-production-in-fy24-up-from-9-earlier-124011701075_1.html
- https://www.india-briefing.com/news/apple-contract-manufacturing-india-new-suppliers-getting-clearance-26947.html/#:~:text=Presently%2C%20India%20contributes%20to%20seven%20percent%20of%20Apple's%20iPhone%20production
- https://inc42.com/buzz/apple-india-revenue-nears-6-bn-milestone-in-fy23/
- https://zeenews.india.com/economy/pli-for-large-scale-electronics-manufacturing-sees-rs-6887-cr-worth-investment-2647782.html
- https://www.business-standard.com/industry/auto/deadline-nearing-70-of-fame-target-met-1-22-mn-vehicles-supported-so-far-124010100652_1.html
- https://www.counterpointresearch.com/insights/global-smartphone-share/

- https://www.counterpointresearch.com/insights/smartphones-odm-h1-2021/
- https://timesofindia.indiatimes.com/education/news/only-3-engineer-graduates-get-high-quality-tech-jobs-in-india-report/articleshow/76998063.cms
- https://www.vietdata.vn/post/gdp-in-2023-will-reach-430-billion-usd-experts-predict-that-vietnam-will-surpass-singapore-and-thai#:~:text=According%20to%20data%20from%20the,34th%20according%20to%20CEBR's%20rankings.
- https://en.wikipedia.org/wiki/Economy_of_Malaysia#:~:text=%24430.895%20billion%20(nominal%3B%202023%20est,(PPP%3B%202023%20est.
- https://www.vietnam-briefing.com/doing-business-guide/vietnam/taxation-and-accounting/tax-incentives-for-businesses
- https://www.vietnam-briefing.com/doing-business-guide/vietnam/taxation-and-accounting/tax-incentives-for-businesses
- https://en.expertis.vn/investment-incentives-part-2/
- https://vietnamnews.vn/economy/1582682/ministry-proposes-policies-to-promote-supporting-industries.html
- https://vietnamnews.vn/economy/1594995/smes-can-borrow-loans-at-preferential-interest-rate-of-1-2-per-year.html#:~:text=H%C3%80%20N%E1%BB%98I%20%E2%80%94%20Firms%20can%20borrow,of%20Planning%20and%20Investment%20announced.
- https://vietnamnews.vn/economy/1594995/smes-can-borrow-loans-at-preferential-interest-rate-of-1-2-per-year.html#:~:text=H%C3%80%20N%E1%BB%98I%20%E2%80%94%20Firms%20can%20borrow,of%20Planning%20and%20Investment%20announced
- https://www.vietnam-briefing.com/doing-business-guide/vietnam/taxation-and-accounting/tax-incentives-for-businesses
- https://www.pwc.com/vn/en/publications/2023/pwc-vietnam-ptb-2023-en.pdf
- https://hanoitimes.vn/samsung-plants-in-vietnam-generate-revenue-of-over-us70-billion-in-2022-323090.html#:~:text=Samsung%20plants%20in%20Vietnam%20generate%20revenue%20of%20over%20US%2470%20billion%20in%202022&text=Samsung%20has%20already%20invested%20%2418,over%20the%20next%20two%20years
- https://www.mida.gov.my/wp-content/uploads/2024/01/ENG-MIDA_Policy-Booklet_MK-2022_Updated_11_01_Chapter-2.pdf
- https://mastic.mosti.gov.my/sti/incentives/business-growth-fund-bgf
- https://www.mida.gov.my/forms-and-guidelines/industry-4-0-industry4wrd-incentives/industry4wrd-intervention-fund/
- https://kpmg.com/xx/en/home/insights/2023/12/flash-alert-2023-232.html#:~:text=It%20is%20proposed%20that%20a,approved%20for%20the%20GSH%20incentive.
- https://www.accaglobal.com/gb/en/student/exam-support-resources/professional-exams-study-resources/p6/technical-articles/incentives.html

- https://assets.kpmg.com/content/dam/kpmg/cn/pdf/en/2021/02/china-vat-essentials-guide-2021.pdf
- https://www.hawksford.com/insights-and-guides/china-business-guides/tax-incentives-for-high-tech-enterprises-in-china#:~:text=Qualified%20high%2Dtech%20enterprises%20may,the%20high%2Dtech%20enterprise%20certificate
- https://www.semiconductors.org/taking-stock-of-chinas-semiconductor-industry/
- https://www.datacenterknowledge.com/archives/2017/03/28/chinas-top-chipmaker-secures-22-billion-to-expand-globally
- https://isdp.eu/content/uploads/2018/06/Made-in-China-Backgrounder.pdf
- https://www.china-briefing.com/news/tax-incentives-china-to-encourage-technology-innovation-updated/
- https://investtaiwan.nat.gov.tw/showPageeng249?lang=eng&search=249#:~:text=At%20present%20Taiwan%20has%2010,land%20is%20only%20for%20leasing.
- https://m.economictimes.com/small-biz/trade/exports/insights/taiwan-passes-its-chips-act-offers-tax-credits-to-chipmakers/articleshow/96844401.cms
- https://techwireasia.com/01/2023/taiwan-passed-its-chips-act-allowing-chipmakers-to-flip-rd-costs-into-tax-credits/
- https://www.bycpa.com/html/news/201610/1998.html
- https://www.firstpost.com/tech/india-mobile-phone-manufacturing-at-44-billion-exports-at-11-billion-says-it-minister-vaishnaw-13438992.html
- https://www.business-standard.com/india-news/mobile-phone-manufacturing-to-reach-50-billion-ashwini-vaishnaw-123120700988_1.html
- https://economictimes.indiatimes.com/tech/technology/rs-10000-crore-sops-in-works-for-semicon-ancillaries/articleshow/105968837.cms?from=mdr

Notes

Designed by:

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MAVIC AIR
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GPS

NITI Aayog